'68' MICRO JOURNAL

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VOLUME III ISSUE VI • Devoted to the 68XX User • June 1981

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UniFLEX™

Multi-User

UniFLEX is the first full capability multi-user operating system available for microprocessors. Designed for the 6809 and 68000, it offers its users a very friendly computing environment. After a user 'logs-in' with his user name and password, any of the system programs may be run at will. One user may run the text editor while another runs BASIC and still another runs the C compiler. Each user operates in his own system environment, unaware of other user activity. The total number of users is only restricted by the resources and efficiency of the hardware in use.

Multi-Tasking

UniFLEX is a true multi-tasking operating system. Not only may several users run different programs, but one user may run several programs at a time. For example, a compilation of one file could be initiated while simultaneously making changes to another file using the text editor. New tasks are generated in the system by the 'fork' operation. Tasks may be run in the background or 'locked' in main memory to assist critical response times. Inter-task communication is also supported through the 'pipe' mechanism.

Support

The design of UniFLEX, with its hierarchical file system and device independent I/O, allows the creation of a variety of complex support programs. There is currently a wide variety of software available and under development. Included in this list is a Text Processing System for word processing functions, BASIC interpreter and precompiler for general programming and educational use, native C and Pascal compilers for more advanced programming, sort/merge for business applications, and a variety of debug packages. The standard system includes a text editor, assembler, and about forty utility programs. UniFLEX for 6809 is sold with a single CPU license and one years maintenance for $450.00. Additional yearly maintenance is available for $100.00. OEM licenses are also available.

FLEX™

UniFLEX is offered for the advanced microprocessor systems. FLEX, the industry standard for 6800 and 6809 systems, is offered for smaller, single user systems. A full line of FLEX support software and OEM licenses are also available.

technical systems consultants, inc.
Box 2570, West Lafayette, IN 47906
(317) 463-2502 Telex 276143

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'68' MICRO JOURNAL

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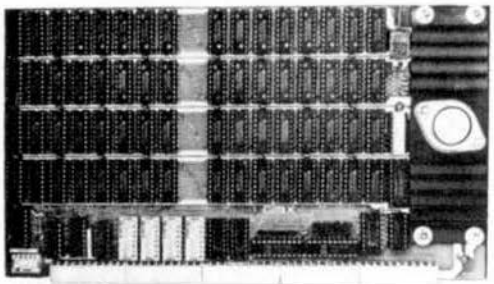

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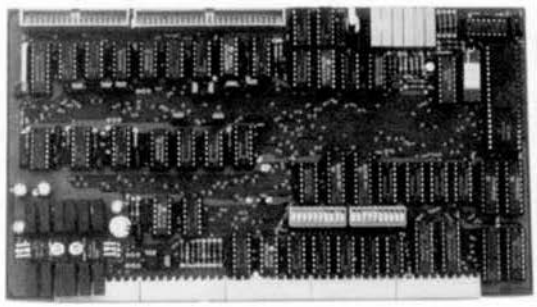

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SEE GHOST AD PAGES 35, 43, 46, 47, 48, & 56

BASIC09™ has a dual personality.

One craves meat-and-potatoes BASIC.

The other prefers Programme ala Pascal.

Some people say BASIC09 is really a PASCAL in disguise, others say it's still BASIC. You'll understand this delightful dilemma when you look at both versions of the "bubble sort" program shown below: both can be run by BASIC09. The program on top is unstructured and hard to understand, but it's traditional BASIC. The program on the bottom is well-structured and easy to follow, a virtue of PASCAL. With BASIC09 you can program either way, or mix the best of both. It's like getting two languages for the price of one.

SORT AN ARRAY
IN ASCENDING SEQUENCE

```
90   DIM A(5)
100  I=5
110  IF I=1 THEN 200
120  FOR J=1 TO I-1
130  IF A(J)<=A(J+1) THEN 170
140  T=A(J+1)
150  A(J+1)=A(J)
160  A(J)=T
170  NEXT J
180  I=I-1
190  GOTO 110
200  RETURN
```

```
DIM array(5)
outer=5
WHILE outer>1 DO
  outer=outer-1
  FOR inner=1 TO outer
    IF array(inner)>=array(inner+1) THEN
      temp=array(inner+1)
      array(inner+1)=array(inner)
      array(inner)=temp
    ENDIF
  NEXT inner
ENDWHILE
RETURN
```

Makes programs better

BASIC09 has five kinds of loop structures: WHILE . . DO, REPEAT . . UNTIL, LOOP . . ENDLOOP, FOR . . NEXT and IF . . THEN . . ELSE. If one of the five built-in data types (byte, integer, real, string, and boolean) doesn't suit the problem, you can make a new one of your liking with the TYPE statement. Need a tree, linked list, or symbol table? Complex non-rectangular data structures using any combination of data types are easy to define. Modular programming breaks down large programs to smaller, more manageable elements. BASIC09 lets you create independent program modules called "procedures" with local variables for recursion plus parameter passing to any other BASIC09 or machine language procedure. There is a complete set of statements for device-independent sequential or random I/O, plus a superlative PRINT USING system.

Makes programs faster

No full-feature BASIC for any 8-bit microprocessor is faster than BASIC09, because it is an interactive compiler. As each program line is entered, it is instantly compiled to a smaller, faster form. Because BASIC09 automatically converts programs back to original "source" form for listing, it is as friendly and easy-to-use as traditional interpreter BASICs. Each procedure can be independently compiled to position-independent, reentrant, ROMable format. Microware® developed a new ultra-fast 9-digit-accuracy floating point math system just for BASIC09. And if that's still not fast enough, there's BYTE and INTEGER arithmetic.

Features that make programs easier to write

The compiler is integrated with a full-feature string AND line-number oriented text editor. If you make a mistake, BASIC09 tells you instantly. String-oriented commands such as search, change, change all occurances, delete, and insert can be used on programs with or without line numbers. There's an automatic line renumbering function too.

Features that make programs easy to test

Debugging often takes longer than writing a program. That's why BASIC09's integral high-level debugger sets it apart from all other compiled OR interpretive languages. The TRACE command shows you each statement executed in BASIC form, plus the result of any expression evaluation. STEP lets you run one or more statements at a time. LET and PRINT allow you to examine or change the values of variables, by name. STATE lists procedure calling order. And there are nine other debug commands. If you need to correct a program, you can edit, recompile, and rerun it in seconds.

Microware® software is available for most popular 6809 computer systems. Source listings and yearly maintenance update service are sold separately for most programs.

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Does timesharing on a small system make sense?

It does with OS-9™ Level One!

Now two (or more) acts can share your microcomputer stage. You will no longer have to walk away from your computer while it is busy running a long program. Because OS-9 is a multitasking operating system, you can be running a BASIC program while editing a PASCAL program, for example. This lets you make more efficient use of your time and your system, even if you only use one terminal. If your application requires multiple, independent terminals, one OS-9 system can do the work of several single-user systems.

The convenience of an advanced operating system

Sophistication does not require complexity. Many OS-9 users say that it is actually easier to use than the older 6800-type operating systems. Consider how easy it is to run multiple programs: to run a program you just type its name and hit 'return.' To run a program as a separate job, you type its name, an '&' character, then hit return. The program runs as usual, but OS-9 comes back immediately and is ready for your next command. Simple commands let you see each program's status, set its priority, or abort it.

The file management system has fast, byte-addressable random-and sequential-access files. The tree-structured multiple directory system lets you create separate disk directories for each user, project, or application. Command line I/O file redirection means you specify what device and/or files a program will use when you run it, not when you write it.

Efficiency and hardware versatility

No other operating system can run on such a broad range of hardware: the overall RAM requirement for Level One is 32K to 56K RAM. Memory utilization is superlative because OS-9 lets multiple tasks "share" the same reentrant program. For example, if two users run BASIC09, only one "copy" is actually loaded into memory. The Level Two version of OS-9 can utilize up to a megabyte of memory on systems having memory management hardware (both versions come with complete timesharing support).

OS-9's device independent I/O system can handle almost any number and combination of I/O devices: five or eight inch diskettes, winchester disks, disk cartridges, serial and parallel ports, memory-mapped video displays, and more.

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Each OS-9 package comes with a User's Manual and a System Programmer's Manual that cover every aspect of OS-9. If you have special requirements, you can even purchase the Source Code for most of OS-9 and related software. At Microware® we take pride in offering the best customer support in the business. Technical advice and assistance by phone, mail or telex is available during all business hours.

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SOFT WARE!

X-FORTH

FLEX COMPATIBLE FORTH

By Charles (Chuck) Eaker, Ph.D

X-FORTH is the best FORTH there is for 6809/6800 computers running FLEX! There's no better way to put it, X-FORTH beats the competition hands down and here's why.

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She has a FULL SCREEN EDITOR for terminals that support cursor addressing.

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She uses standard MOTOROLA mnemonics thus:

'LDA [44]' becomes '[44] LDA' in X-FORTH

6809 assembler also supports 6800 mnemonics!

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2... **GOING X-FORTH**

X-FORTH extentions and FLEX interface.

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3... **USER'S MANUAL AND DOCUMENTATION**

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2 glossaries. 1 sorted by function and the other alphabetically

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By Peter Murray

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'68' MICRO JOURNAL says "Every once in a while a piece of software comes along that indicates a quantum jump in the state of an ..... such a program is JCP."

See Review in July '80 '68' Micro

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By Dale Puckett

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'68' MICRO JOURNAL points out that "(Readtest) is a yardstick with which you can gage your progress. You will find, however, even if you are already an experienced writer, that READTEST will keep you honest when you start rambling."

See Review in August '80 '68' Micro

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By Bud Pass

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By Tom Speer

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INCLUDES SOURCE ON DISK

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An exercise in artificial intelligence
By Dale Puckett

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WATCH FOR ADDITIONAL LISTINGS ....

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Help for FLEX™
By Frank Hogg & Dale Puckett

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The HELP interpreter with its 61 commands reads information from one of three text files, so adding, modifying or deleting information is easy. You can also create your own HELP file. Everybody needs a little HELP!

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Our precision plastic injection molded case eliminates most costly hand assembly, which keeps the price low and the quality high.

Everything you need.
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If you want a simple, no-frills printer. If you don't want to buy features you'll never use. If you want a reliable printer backed by the world's largest manufacturer of print mechanisms, we're afraid there's only one logical choice.

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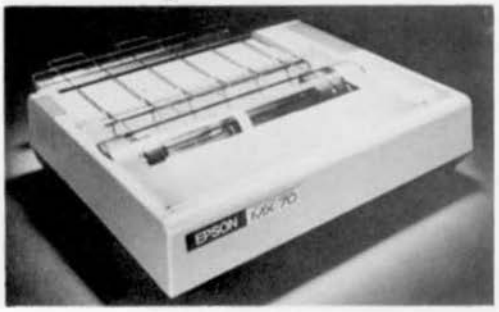
The Epson MX-70



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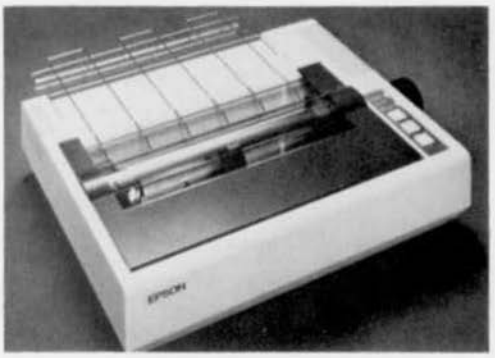

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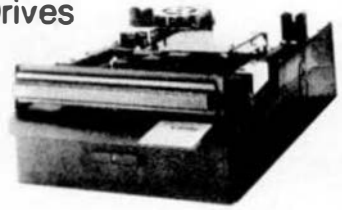

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DMW - - - - -

BE A WINNER

68 MICRO JOURNAL has purchased a limited quanity of autographed copies of "MICROCOMPUTER ARCHITECTURE AND PROGRAMMING", by Professor John Wakerly, of Stanford University. This excellent text book is based on the MC6809 CPU.

For the next few months (as long as supply last) we will award a FREE autographed copy for the best article submitted each month, in two (2) catagories. One catagory will be Standard S50 Bus computers (GIMIX, SSB, SWTPC, etc.). The other catagory will be non-Standard S50 Bus Computers (TRS80 Color Computer, Wave Mate, Tano, APF, etc.). This excellent tutorial on both programming and the 6809 is a regular $27.95 value. In our opinion this is the best book available for the beginning as well as seasoned programmer. It covers the MC6809 CPU, and gives an insight into some of the other CPU devices currently available. These include the MC68000, DEC PDP-11 LSI-11, Z8000, TI 9900, Intel 8086 and MCS-48 series. After reviewing and comparing these computer devices it will be apparent why the 68XX series is fast becoming the industry 'standard'.

Professor Wakerly is not only a well known educator and consultant in the microcomputer field, but is an avid 68XX user and has contributed to many segments of the microcomputer industry. His evaluation of the 6809 is: "the Motorola 6809 had the very best architecture from a *pedagogical point of view". His treatment of various 'high level languages', especially PASCAL is second to none. It comes highly recommended by not only this writer, but many of the most knowledgeable experts in the field of computers. It is a MUST for those wishing to acheive the most from the 6809 microcomputer. NOTE: see advertisement, this issue.

We would encourage users of the non-standard S50 bus computers such as the TRS80 COLOR COMPUTER to submit articles, hints or bug traps, tips on hardware and software and anything else that could make life a little easier and more enjoyable for other users. It is by sharing that we all enefit - so let all of us know and share in your hints, kinks, hardware and software ventures. Also you could be a winner (in more ways than one).

*** Pedagogical [adj.] - characteristic of the science of teaching.**

Flex User Notes

BY: RONALD W. ANDERSON
3540 STRUBRIDGE COURT
ANN ARBOR, MI 48105

ANNIVERSARY

This is the 12th column I have done for '68' Micro Journal and Don Williams, though I believe some had too many listings and Don got caught up on them one month, so this is actually the 13th issue in which my column has appeared. I've received a lot of encouragement and a few bricks in the mail. I'd like to thank you all for expressing your opinions good or bad. I long ago learned that the only way to please everyone was not to do much, and to have no opinions about anything. I've always pretty much said what I thought and not worried too much about whether a few people didn't like it. My opinions are just that, and you are all free to disagree if you like. Don Williams tells me that I am "very critical of software/hardware that I use/review". I agree completely. I have to write sort of from where I am. I've assumed that most of the readers of this have a SS-50 system with a disk drive and some version of FLEX running. A further assumption is that you have as a minimum the TSC Assembler, Editor, and Text Processor (maybe). I am also assuming that the average reader of this is not independently wealthy and able to buy one of everything that comes along.

On this basis, I feel kind of a responsibility to evaluate new software critically. It is nice if some new Assembler does all that is claimed for it in the ads, but will it do more for you than your present assembler? Is that new Editor better than the Standard one? If it has new features that are nice, are there some things that old Standard will do that it won't? Is the software written for a hobbyist who is familiar with programming or is it for business use? Software written for business use (particularly the Microcomputer software for small machines) it is very likely to be used by people with no familiarity with computers and computing. Therefore business software must be VERY CLEAR in its operator prompts and it must be VERY HARD to do something like delete a database file. The program must make extremely clear to the operator the result of what he/she is about to do, and it must always allow a way to abort the immediate operation without damaging a file or losing data. The ultimate in business software would be prompts so clear that a user manual is not needed. I don't expect that we will approach that level very soon. Meanwhile, however, it should be a goal. Business software must be crash proof. Operator errors should cause error messages and a chance to "back out". Crashes that lead to system error messages such as ERROR #23 in line 9327, are unforgivable. Crashes that lead to the necessity to reset the computer are even worse. In other words, we hobbyists are a bit more "forgiving" of good software that has a few kinks in the operation. If we lose a file, generally we just re-enter the data and remember not to make the same mistake again. Business software, in my opinion must be judged by much more strict standards.

I don't think I should give every new piece of software a rave review just because it works. I know, Don, someone like me makes it harder for you to sell advertising on occasion. I've probably done myself out of some reviews by being critical. Sorry, but that's the way it is.

NEW SOFTWARE REFLECTS 6809 ARCHITECTURE

Having made my pitch about being hardnosed, I now have to modify an opinion I presented a few months ago here. I compared some factual data on some 6800-09 compilers and made the statement that I had not separated the 6800 and 6809 versions because of the small differences in performance, and the fact that much of the '09 things were reassemblies of unmodified 6800 source code anyway. Recently I've seen a lot of new things that have clearly been written to take full advantage of the capabilities of the 6809. One case in point is the Forth Interest Group 6809 implementation of FORTH. This was written by R. J. Talbot Jr. who also did the tFORTH for Kenyon Microsystems, according to the review by Dale Puckett in the March (I think) '68'. Fig supplies the source listing of the implementation, and I can assure you that the 6809 was designed for implementing FORTH (or vice versa). Talbot has used all the 6809 registers and addressing modes to great advantage in his implementation. The Kenyon version (though I don't have it) has to be a winner.

My employer recently purchased Omegasoft Pascal, a compiler that produces assembler source code that is then assembled and loaded, much like the procedure used for Hemenway's STRUBAL+ and Software Dynamics BASIC compiler. We also purchased the Source listings of the Runtime library. This is very well written 6809 code, again taking advantage of the processor's capabilities. It executes programs at speeds approaching the very fastest of the compilers available for the 68xx. I won't go into all the detail here, since I will probably have written a review of it by the time you read this. At this writing, I have no way of telling whether you will see this or the review first. Let me just say that it executed my Prime Numbers Benchmark program for primes to 1000 in just over 4 seconds. That's more than 10 times faster than TSC BASIC. (No slur on TSC intended here, interpreters just have to run slower than compiled code. The comparison is just for a point of reference.)

This brings me to a prediction that may make some of you mad and others sad. I had a conversation recently with Frank Hogg, who is becoming a major supplier of 6800-09 software. He indicated that once the programmers he is working with have used the 6809 they almost refuse to go back to programming the 6800. He indicated that probably he would no longer offer 6800 versions of new software.

(Ed's Note; in talking to Frank he indicated to us that Hogg Dental Lab will continue to support the 6800 for as long as he can secure 'GOOD' 6800 software. However, he does say that the number of programme s using the 6800 are diminishing.)

First there is no software to take advantage of the capabilities of the new processor, then, once programmers get to using its features, they don't want to go back. The prediction, of course, that support for the 6800 will dwindle as 6809 support picks up. There is still a lot of good 6800 software around, and more will continue to come for some time of course, but the trend is already in the making with such software as Stylograph and the Omegasoft Pascal mentioned above. The 6809 was kind of "eased in" by the fact that the '09 assembler was designed to accept all the 6800 instructions. Too bad that doesn't work in reverse. I kind of hope I'm wrong or at least that the transition is gradual. I indicated several months ago that I felt that the only real advantage of the 6809 is to the programmer who has to generate Assembler code for it. Looks like the programmers have found that out. That of course is a gross oversimplification. If it is easier to program there will be more and better software available for it, done with less effort, supposedly resulting in better software at lower cost.

THE PRIME NUMBERS GAME

I just finished reading the 6809 Performance Timings by Al Moreira in the Feb. issue of '68'. They show that, running the same program, the 6809 is faster than the Z-80. They also indicate that Lucidata Pascal

is faster than TSC BASIC, which should be the case since the Pascal runs P-code and doesn't have to interpret every line. I think I can draw a rather more dramatic conclusion from the data. It is simply that the program itself makes a vastly larger difference in the performance of the computer than does the processor type. The program used for these tests was not optimized as Mr. Moreira pointed out. This is not meant to be critical of the results of the tests. They are quite valid. However, the Prime Number problem is a little pet of mine, on which I have worked now and then over a long period of time. Some long thought has indicated that there is a much more efficient algorithm for finding the primes. I'm sure the one I will present here may still be improved upon, perhaps by a factor of several times. Before presenting the algorithm, let me discuss the problem and the results of my tests. Then we will look at how time may be saved. Mr. Moreira reports TSC BASIC taking 4 hours and 17 minutes to find the primes. (All tests were to find all primes within the number range of 1 to 10000). He reports Lucidata Pascal as finding them in 2 hours and 16 minutes. My recent report on several compilers gave time for primes to the limit of 1000, and I reran them for the higher limit with the following result:

TSC Extended BASIC (using integer variables)	7 min. 0 sec.
Lucidata Pascal	4 min. 27 sec.
Omegasoft Pascal	1 min. 12 sec.

While the difference between TRS-80 BASIC and TSC BASIC times were in the ratio of 3 to 2 approximately, the effect of changing the program was to reduce the Lucidata Pascal time from 2 hours and 16 minutes to 4 minutes and 27 seconds, a ratio of 30 to 1. Probably because I used integer variables in my version of the TSC BASIC program, the improvement here is even greater. The ratio is almost 38 to 1. Why such a large difference. First of all, for those of you who might not know, a Prime number is a number that has no other integer factors than 1 and itself. That is, it is not the product of two other numbers. 15 is the product of 5 and 3 so it is not prime. There are no factors of 17 other than 1 and 17, so it is prime. It should be obvious that all even numbers are divisible by 2 and so are not primes (except for 2 itself). By this definition, 1, 2, and 3 qualify as primes. The first and most obvious way to find primes is to test each odd number to see if it is divisible by some other smaller number. The program in Mr. Moreira's article does just that. In fact there is some optimization begun. The question arises as to just how high the "test divisors" have to get before we can stop testing and decide that the number being tested is a prime. All numbers are divisible by 1 so we don't need to test that. If we are testing only odd numbers, the number can't be divisible by 2. In fact, the first number that could be a factor is 3. If three were a factor we would have found it when we tested 3, and the other factor would have to be 1/3 of the number being tested. Therefore we don't have to test divisors greater than 1/3 of the number we are testing. But wait, we're coming to a generalization here. What are the two largest factors possible, (I mean maximize both factors). Obviously, if both factors are as large as possible they will have to be equal and must both be the square root of the number being tested. Ie. If the number being tested is 25, the largest possible factors are 5 and 5 since 5*5=25, 5 is the square root of 25.

Now here is the insight. If one of the factors is larger than the square root of the number being tested, the other will be smaller. If there are two factors whose product is the number in question, it is not prime, and we would have discovered the smaller one before we test a divisor larger than the square root of the number being tested. The Algorithm in the article tested divisors up to 1/2 of the number being tested. If there are multiple factors, we will discover one even sooner. In the case of the numbers approaching 10000, there were 2500 test divisions being made to see if any came out even (odd numbers to 5000). Numbers need not be tested over 100, and so only a maximum of 50 tests need be made for the numbers as they approach 10000. You can see that this vastly reduces the work the computer must do for the larger numbers. The improvement for small numbers is not as dramatic. Further, it may be shown that only prime numbers need be tested as divisors. If the number being tested is divisible by 9, for example, it is also divisible by 3, and that fact would have been discovered before the test divisor reached 9. This further reduces the work the program has to do. There are 26 primes between 1 and 100. (two of those are 1 and 2) so only 24 test divisors are required to check a number in the range of 10000.

What my program does, is to save the first primes found, in an array, and use them for test divisors, each time testing divisors only less than the square root of the number being tested. Since the square root function is slow, it tests to see if the square of the test divisor is greater than the number being tested. If this point is reached without any "even" divisions, the number is guaranteed to be a prime. When the Progrem has saved a prime that is greater than the square root of the maximum number to be tested, it sets a switch and no more primes are saved. Most compilers use 16 bit signed integer arithmetic, and the program here will find primes approaching the upper limit of 32000. For testing numbers in that area, an array dimension of 50 is adequate. There is of course a little overhead in the array accessing and saving of primes. Still the overall saving is very large. The times reported here are for the numbers to be output to my terminal running at 19.2Kbaud. If the ratio holds, a 6809 assembler program ought to be possible that would run this program in about 10 seconds. If you are skeptical of the above arguments, I can only say that my program produces the same answers as the longer one does.

Just to complete the picture, there is an even faster method of finding the primes, called the sieve of Erastosthenes. All the odd numbers to be tested are put in an array. Now, starting at the number 3, all of its multiples (not including 3) are removed and zero put in their place, ie 9,15,21, etc (remember that all the even multiples are already missing). These multiples of 3 are obviously not primes. Next the multiples of 5 are "crossed out", etc. Again, the process need only be carried to the square root of the largest number being tested. This is the backdoor approach to the problem. Rather than finding primes, it essentially finds and eliminates all the non-primes. Of course to set up the array for odd numbers to 10000 you need an array of dimension 5000. For a 16 bit integer arithmetic compiler or assembler, that takes 10000 memory locations for the array. This illustrates the point so aptly put by someone that "there ain't no free lunch". This is one of the most infallable rules of Engineering. To get one thing (speed increase in this case) you trade off a larger memory requirement. To get ease of programming, we use a compiler and trade off a less efficient use of memory and a slower execution for programmer's time. If we have the memory available, that is no penalty, and if the execution is acceptably fast, we've saved a bundle of money by having the programers use a high level language rather than assembler. My estimate based on some experience with rather large programs indicates that the reduction in programming time for Pascal over assembler is about 1 to 7. There is another time saving there, and that is the listing time. It is tolerable to relist 20 pages of a Pascal program but 140 pages for the equivalent Assembler version gets to be a real chore, so the programmers struggle along with a listing that has more red ink marks than original listing and try to keep straight all the changes for a couple of days before running a new listing.

Well, there it is people. Point I started out to make is that a little smarter program is sometimes much more effective in reducing running time than a much faster processor! Realize that the optimized program described above runs 72 seconds in Omegasoft Pascal and the original runs 56 seconds in IBM 370/148 assembler!

Want some more examples? How about this one. We have a data file of 300 names and addresses in alphabetical order, and want to add 20 more names. Slow way is to add the 20 names at the end of the file and then sort the 320 names. Fast way is to put the 20 names in memory and sort them first. Then, it only takes one pass reading the large file and inserting the small batch of names (called merging the files), and writing the result to a new file. In fact, if you want to see a tremendous range of efficiencies for useful programs, get a book on the subject of sorting. The no free lunch rule applies here too. The simplest sorts are slow, faster ones require more program and more memory to run.

INTERMITTENTS

In my Feb. column I mentioned some intermittent problems that had been bothering my system. Several people have written with solutions that have worked on their systems. There seem to be just about three problems, which I will discuss in turn here.

The problem that got top mention, was one that I had already taken care of on my system. Many of us have the old original SWTPC chassis with its power supply, designed when we thought 16K was a fantastic amount of memory. Now, many of us have 32K, 48K, or 56K plugged in, and then have added several I/O cards for peripherals such as a modem, printer, interrupt timer, eprom programmer, etc. That power supply simply was not designed to power all that stuff. The unregulated voltage in mine had dropped to around 7 volts or a little less, and some of the 7805 regulators just don't regulate with the input only 2 volts higher than the output. My solution was to look through the catalogs and find a couple of 10 amp 4 volt transformers and wire them in series. Result was too much voltage, but they were of the open frame construction and I was able to remove some of the secondary winding turns from one of them until the voltage was reduced to around 8 1/2, (the DC voltage at the filter capacitor), which seems to work fine.

One reader wrote that the 10 amp fuse in the SWTPC power supply is in a "cheap" holder and he was losing 1/2 volt there. Cleaning and bending of the contacts eliminated most of that.

Having cured that problem, I think, was the main cause of the next one that I ran into. This new problem was exaggerated by the fact that I had just added two 8 inch disk drives and a DMA controller to my system. The direct memory access is more critical of memory access time than normal operation, and I would guess that excessive heat probably increases the access time. Anyway, I found that after my system had run for a half hour, I got lots of disk read errors. The system would retry several times in reading in a file. One night I found that a fan blowing through the area of the memory and processor cards in my system eliminated this problem completely. Boosting the unregulated voltage means that the on board regulators have to throw away more power, so they run hotter. Increasing the input from 7 volts to 9 volts, increases the drop across the regulator from 2 to 4 volts and the load current remains the same if the regulator is regulating, so that doubles the power dissipation in all the regulators. Of course, that increases the heat build-up in the memory and processor boards. Another factor there is that we have all the card slots filled so there can be no space between cards. If you have less cards than slots, by all means space them apart as much as possible, leaving a space next to the ones with the most heatsinks or the ones you know to be using the most power.

Without going into a great deal of theory, I will mention another cure mentioned by one reader. The SS-50 bus is driven by a class of integrated circuits known as TTL (Transistor-Transistor Logic). These devices work best when the bus lines are terminated with a proper load. A pair of resistors, one to the +5 supply (360 ohms) and one to ground (390 ohms) on each bus line provide the proper termination, and considerably reduce the noise on the bus. There are available circuits for "active terminations", a fancy word for a regulated voltage return for the terminating resistors, that allows use of only one resistor for each bus line. Claims are made that the active terminator reduces the power supply current over having the two resistors, but without thinking through a thorough analysis, it seems to me that that can only be true when the bus lines are in the "unselected" or Tri-stated high impedance condition. Kilobaud Microcomputing for April 1980 has two articles describing active termination circuits. Be careful, the one by Clive Bolton (pg. 110) is the simpler of the two, and may be tempting, but it can only work when more of the bus lines are low than high. The 7805 regulator shown can't possibly sink current, which it would have to do to regulate when more bus lines are high than low. Even if the 7805 were capable of sinking to its ground terminal, The circuit in the article wouldn't let it, because of the resistance of the potentiometer in the ground path, which would normally be set about to its center. This resistance would prevent it from sinking current sufficient to stay in regulation if there were one or two more bus lines high than low. (Since writing this, I've received a letter assuring me that this circuit does work. The only way I can see it having a chance is that the busses for a "1" don't go much above the 2.6 volt termination reference level. If this is true, the circuit will probably work except in very rare circumstances when nearly all of the busses are in the "1" or high state.

The one described in the article by Craig Anderton on Pg. 52 (which is a description of Bill Godbout's mother board) will work fine. There is a schematic but no parts list given there. Since I haven't tried this yet, I have not chosen components and have no recommendations at this time. About the only thing critical would be that the output transistors, the ones driving the bus termination line, would have to be of the "power tab" type and would have to be heatsinked. Since this circuit illustration is copyright by Bill Godbout, I won't reproduce it here. If there is some interest in this, or if anyone has done it with noted improvement in operation I will design one that works on my system and pass the word along here in a later column. One caution here. A poor design could cause more problems than it cures, since if the termination voltage doesn't remain constant the result is essentially to feed signals from one bus to the others, the result could be to increase the "noise" on the busses!

Summarizing, the three things that seem to eliminate intermittents (aside from cleaning dirty connector pins) are proper unregulated power supply voltage, forced air cooling, and bus termination.

The following are the listing that accompanied the 'FLEX USER NOTES' in the May '81 issue.

```
10 REM APPROXIMATION FOR SINE (X) FOR 0<X<PI/2
20 REM
30 INPUT "FIRST POWER COEFFICIENT",K
40 INPUT "THIRD POWER COEFFICIENT",K1
45 INPUT "FIFTH POWER COEFFICIENT",K2
50 PRINT "ANGLE      SINE          APPROXIMATION          ERROR"
60 FOR N=0 TO 16
70 N1=N/10.0
75 AP=K*N1-K1*N1*N1*N1+K2*N1*N1*N1*N1*N1
80 PRINT USING "##.######",N,SIN(N1),AP,AP-SIN(N1)
90 NEXT N
100 GOTO 30
110 REM K=.99963  K1=.16558   K2=.007477 YIELDS .0006$ ERROR
```

```
                                NAM   PUZZLE
                                TTL   WHAT'S WRONG
                          *
                          *
                          * THIS PROGRAM HAS BEEN ASSEMBLED USING TSC 6809 ASSEMBLER.
                          * THERE IS NOTHING WRONG WITH THE ASSEMBLER (EXCEPT PERHAPS
                          * THAT IT DOESN'T DETECT AND FLAG THIS ERROR.)
                          *
                          * CAN YOU TELL WHAT IS WRONG?
                          *
                                ORG   PART2
0005                      *
                          * THIS IS THE SECOND PART OF THE PROGRAM
                          *
0005 A7   84        LABEL6  STAA  0,X
0007 86   7F        LABEL7  LDAA  #$7F
0009 4A                     DECA
000A 26   F6                BNE   LABEL7
000C 20   F0                BRA   LABEL8
000E 0005                   FDB   LABEL6
0010 39             LABEL8  RTS
                          *
0000                        ORG   0
0000 BE   0300      START   LDX   #$300
0003 86   04                LDAA  #4
                    0005    PART2 EQU   *
                          *
                                END   START

0 ERROR(S) DETECTED

SYMBOL TABLE:

LABEL6 0000   LABEL7 0002   LABEL8 000B   PART2 0005   START 0000
```

UNDERSTANDING SUBROUTINES PART 1 — HIGH-LEVEL CONCEPTS

John F. Wakerly
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Mountain View, CA 94041

John Wakerly is an independent consultant and a consulting associate professor at Stanford University. This three-part tutorial on subroutines in Pascal and 6809 assembly language is adapted from his recently-published book, Microcomputer Architecture and Programming, *copyright 1981, with permission of the publishers, John Wiley & Sons, Inc. (The book is also available directly from the author at MSE Books; see advertisement elsewhere in this issue.)*

Prof. Wakerly is an avid 6800 and 6809 programmer and user. Both his book and this article were prepared using word-processing programs that run on his SWTPc 6800 system under the FLEX operating system. The programs include Programma's 6800 PIE text editor, a modified TSC text formatter, a special set of formatting macros, and a special ASCII-to-TTS translation program. These programs ultimately yield files in the TTS code that are punched onto 6-level paper tape and then fed directly into a Mergenthaler VIP phototypesetter. The typesetter produces galleys that are cut and pasted to produce pages such as these.

INTRODUCTION

Subroutines are the key to the structure of programs in any language, high or low level. A *subroutine* is a sequence of instructions that is defined and stored only once in a program, but which may be invoked (or *called*) from one or more places in the program. Two examples of frequently-used subroutines in a typical computer are the instruction sequences that write a character to and read a character from a terminal.

One advantage of using subroutines should be obvious: program size is reduced by storing a commonly-used sequence only once. Instead of repeating the entire sequence each time it is needed, only a single instruction or short sequence of instructions is needed to call the subroutine. Another advantage is crucial in the development of large programs: individual tasks can be defined and processed by subroutines with well-defined interfaces and interactions with the rest of the program. In this way, different programmers can work on different subroutines (i.e., tasks), and individual subroutines can be written, debugged, optimized, and modified, more or less independently from the rest of the program. Indeed, the development of a large program would be virtually impossible without a subroutine mechanism to decompose large tasks into a collection of smaller ones.

All of the advantages of subroutines are amplified by the use of parameters. A *parameter* is a "dummy variable" in the subroutine definition, simply a place-holder whose identity is bound to a real variable or value each time the subroutine is called. The dummy variable in the subroutine definition is called a *formal parameter*, while the variable or value used on a particular call is called an *actual parameter*. Since different actual parameters may be specified on each call of a subroutine, the same subroutine may be used to perform identical processing on many different sets of data. For example, the subroutine `PrintAvg(x,y)` could be defined to print the average of two formal parameters `x` and `y`. Calling `PrintAvg` with three different sets of actual parameters would print three different results: `PrintAvg(1,5)` prints 3; `PrintAvg(17,100)` prints 58.5; and if a=26 and b=58, `PrintAvg(a,b)` prints 42.

The high-level programming language Pascal allows users to write "subroutines" called procedures and functions. In Part 1 of this article we discuss Pascal procedures and functions in depth. We'll assume that you already have a light reading knowledge of simple Pascal, but you don't have to be an experienced Pascal programmer to understand this article.

In Part 2 of the article, we'll show how procedures and functions relate to assembly language subroutines, giving examples in Motorola 6809 assembly language. In this case, we'll expect that you have assembly language programming experience, but not necessarily for the 6809.

In Part 3, we'll introduce the advanced topics of coroutines and recursive programs, giving examples both in Pascal and in 6809 assembly language.

It is useful to study Pascal procedures and functions and assembly language subroutines together for a number of reasons:

- Familiarity with the structure of Pascal procedures and functions can help a programmer improve the structure of corresponding assembly language subroutines.
- Pascal procedures and functions can be useful documentation aids for assembly language programs.
- Assembly language parameter-passing conventions can explain some of the mysteries of the run-time environment of a high-level language. For example, why do the values of local variables in a Pascal procedure become undefined each time the procedure is exited? We'll find out in Part 2.
- A good understanding of both high-level and assembly language parameter-passing conventions is required when a programmer links together high-level and assembly language program modules to perform a task.

AN OVERVIEW OF PASCAL

Pascal is a "structured" high-level language that allows programs and data to be defined in a natural, hierarchical fashion. In addition to having widespread use on large computers in the academic, scientific, and business communities, Pascal has emerged as a very popular high-level language for microcomputers. Pascal compilers exist for all major microcomputers; several microcomputer chip manufacturers provide Pascal-based software; and there is even a microcomputer (the Pascal Microengine by Western Digital Corp.) that has primitive Pascal "P-code" as its machine language.

Three key elements contribute to making Pascal a "structured" language: declarations, block structure, and procedural code. *Declarations* require the programmer to give certain information to the compiler about the structure of the program — the name and types of all variables that will be used, and the names of all labels referenced by discontinuities in program flow (GOTO statements). They also allow a good programmer to give optional information to the compiler and to improve program readability in a number of ways: by defining identifiers that convey the meaning of program constants; by restricting the range of variables to allow automatic error-checking; and by explicitly defining data structures in a way that the compiler supports and a reader understands.

Figure 1 illustrates the *block structure* of Pascal programs. *Statements* specify the actions in a program; Pascal defines both simple and structured statements. A *simple statement* performs a single action; for example, the *assignment statement* "x := (3+y)/7" computes the value of the expression "(3+y)/7" and assigns it to the variable x. A *structured statement* contains one or more other statements and controls them by well-defined rules. The most important structured statement is the *compound statement*, a list of other statements bracketed by the "reserved words" BEGIN and END. Another example is the FOR statement, which repeats a statement a predetermined number of times.

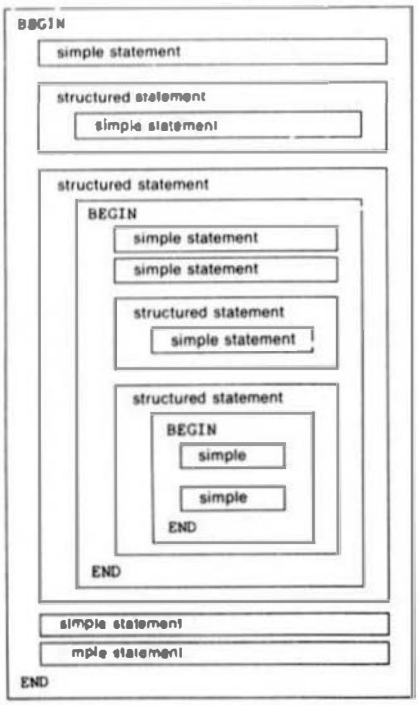


FIGURE 1 Block structure in Pascal.

Now here's where block structure comes in: a structured statement can control *any* statement, including another structured statement. If we draw each statement as a block, the program shown in Figure 1 looks like a "nested" set of blocks. Block structure lets Pascal programs reflect a natural method of problem-solving: repetitively and conditionally executing simple instruction sequences.

Procedural code is the name used to describe a program that is decomposed into modules with well-defined interfaces and interactions. Procedural code results from a "top-down" program design approach, wherein a program is defined in terms of a few high-level modules (procedures and functions), each of which is defined in terms of lower-level modules.

A *procedure* is a defined sequence of declarations and statements that can be invoked by a single statement; it is the Pascal equivalent of an assembly-language subroutine. A *function* is defined similarly, but is invoked by writing the function name in an expression, as one would normally use a variable name. Besides including a number of predefined procedures and functions, Pascal allows each program to define its own procedures and functions. As shown in Figure 2, Pascal supports top-down design by using the same general structure for procedures and functions as it does for programs, and by allowing each procedure or function to define its own subservient procedures and functions.

The *scope* of an item defined within a program or procedure is the part of the program in which that definition is recognized. In Figure 2 the scope of an item defined in a given

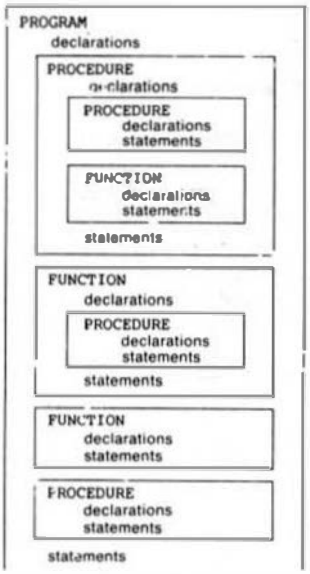


FIGURE 2 Program, procedure and function structure in Pascal.

block is limited to that block and all the smaller blocks contained in it. Items defined in the outermost block are called *global*; items defined in an inner block are *local* to that block. Thus, the programmer may define local variables, data structures, and procedures within one block without concern about possible conflicts in other blocks at the same or higher levels.

For readers who are not very familiar with Pascal, a complete program is shown in Table 1. This program should refresh your memory on the basic features of Pascal. Like all good programs, the example is self-contained so that someone conversant in the language can readily understand it without any other documentation.

PROCEDURES IN PASCAL

A Pascal *procedure* is a program-defined sequence of statements that can be invoked by a single statement, called a *procedure statement*. A procedure is defined in the *procedure and function declaration part* of a program as shown in Figure 3. According to this figure, a procedure may be declared by the reserved word PROCEDURE followed by a *procedure heading* followed by a *block*.

In the *procedure heading*, the *identifier* names the procedure, while the *parameter list* gives the names and types of zero or more formal parameters, as described later.

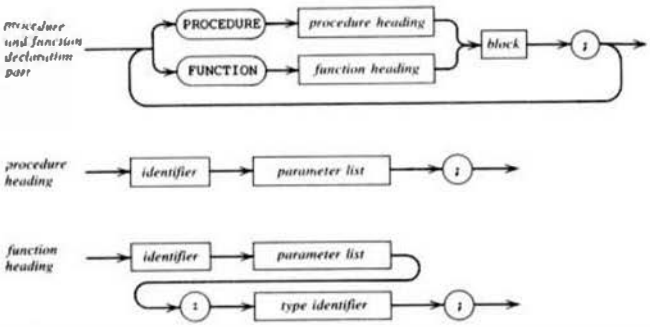


FIGURE 3 Procedure and function declaration part syntax diagram. In this "syntax diagram," rectangular boxes surround the names of program elements that are defined elsewhere, such as "*procedure heading*" and "*block*." Circles or boxes with rounded corners surround special symbols and Pascal reserved words. Syntax diagrams concisely describe the *syntax* of program elements — the format that they must follow. The meaning or *semantics* of a program element must be described separately.

The *block* in a procedure declaration consists of declarations and a statement part, as shown in Figure 4: a procedure block has the same format as a normal Pascal program block. Notice in particular that the procedure block may itself contain additional procedure and function declarations. This allows top-down design, in which a procedure can define its own subservient procedures. Rather than cluttering up the high-level program description with a lot of little low-level procedures, the low-level procedures can be defined inside the high-level procedures that use them.

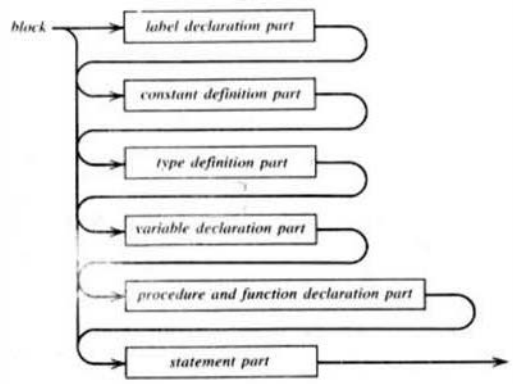
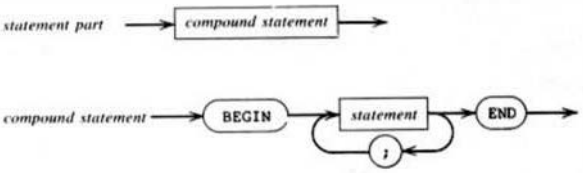


FIGURE 4 Syntax diagram for block and statement part. A block contains six parts in a prescribed order; all parts except the statement part are optional. The statement part may be any compound statement — a sequence of statements separated by semicolons and bracketed by the reserved words BEGIN and END.



A procedure may be invoked (called) by a *procedure statement* which simply gives its name and any actual parameters to be substituted for the formal parameters, as shown in Figure 5. In general, a procedure (or function) must be defined before being invoked.[1]

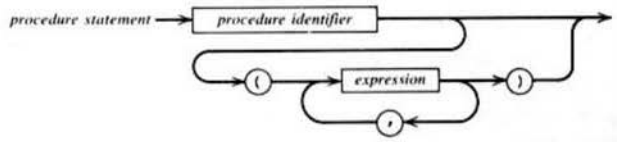


FIGURE 5 Procedure statement syntax. If the procedure has no parameters, then the parentheses are omitted. Otherwise the parentheses contain one actual parameter for each formal parameter in the original procedure definition.

The declarations in a procedure block define constants, variables, types, and additional procedures and functions that are all *local* to the current procedure. Such local items may not be referenced outside the scope of the current procedure; if items with the same names already exist outside, then they are redefined within the procedure without affectingtheir external definitions. If a procedure definition references an item not defined within the procedure, the item must have been defined outside.

The statement part of a procedure block indicates the actions performed each time the procedure is invoked. The values of all local variables are undefined each time the statement part is entered; they are not preserved between successive calls of the procedure.

Table 3 contains a program that removes spaces from input text. The program is rewritten in Table 4 using a procedure `SkipSpaces` to replace the innermost `REPEAT` statement. In the program body, the line "`SkipSpaces`" is the procedure statement; when it is encountered, the programmer-defined sequence (i.e., the `REPEAT` statement) is executed. The program actually became longer by using a procedure in this example, but there are still several advantages to using procedures in general:

- A well-chosen procedure name contributes to program readability by concisely describing the operation being performed.
- Partitioning a program into a hierarchical structure of procedures with well-defined interfaces and interactions makes the program easier to design, debug, maintain, and modify.

[1]Unlike assembly language, the syntax of Pascal was defined so that a program can be compiled by a one-pass algorithm. Since labels, constants, types, variables, and procedures and functions must all be defined before they are used, there are no forward references. However, if two procedures call each other, then neither can be defined before being invoked. Pascal gets around this problem as described in Part 3.

- If a procedure is invoked more than once, program size is reduced compared to the alternative of repeating the procedure body for each invocation.

To illustrate the above ideas, Table 5 shows a more complex program for processing spaces. Instead of being discarded, strings of spaces are converted to the character "@" followed by a letter corresponding to the number of spaces in the string. Also, the main program uses a WHILE instead of a REPEAT statement, so that the terminating period is not printed. This example illustrates a number of concepts:

- The procedure has no parameters, but it communicates with the main program via the global variable inChar.
- The procedure has one local variable cnt, whose value it reinitializes each time it is called.
- The procedure is called from two different places in the main program, the first place to "prime" the WHILE-loop.
- The procedure may be modified to do a better job of space compression without changing the main program. (As an exercise, modify the procedure so that strings of one or two spaces are not translated, and strings of more than 26 spaces are translated into two or more "@x" codes.)

PASCAL FUNCTIONS

A *function* is a programmer-defined sequence of statements that assigns a value to the function name (i.e., *returns* a value). A function is defined much like a procedure, as shown in Figure 3. The *function heading* is like a procedure heading, but it also must specify the *type* of the value returned by the function. The function name (*identifier*) must be assigned a value of this type within the function block. Like a procedure block, a function block may have its own local constants, types, variables, and subservient procedures and functions.

The main difference between procedures and functions is in the way they are invoked. Whenever the function name and actual-parameter list appear in an expression in the calling program, the function statement part is executed, and the last value assigned to the function name in the function statement part is returned to the expression evaluation.

Table 6 shows a program that uses a function to read the next nonspace character of input text. The variable inChar is needed since the function is invoked *every* time the function name appears in an expression. The following main program, although syntactically correct, would read two nonspace characters per iteration but write only one of them:

```
BEGIN
  REPEAT write(NextNonspace)
    UNTIL NextNonspace = '.';
END.
```

The local variable tempChar and the assignment statement in the function statement part in Table 6 are also necessary. The alternative function statement part,

```
BEGIN
  REPEAT read(NextNonspace)
    UNTIL NextNonspace <> ' ';
END;
```

would not use the value just assigned to NextNonSpace in the comparison. Instead, it would cause a recursive call of the function to itself (as explained in Part 3). Unless recursive calls are desired, the function name must not appear in expressions in the function statement part.

PARAMETERS IN PASCAL PROGRAMS

Both procedures and functions in Pascal handle parameters in the same way. A procedure or function declaration indicates formal parameters in a *parameter list*, as shown by the syntax diagram in Figure 6. If there are no parameters, then the parameter list is empty, as in the examples in the previous sections. If there are one or more parameters, then each formal parameter is listed with its type as shown in the examples below:

```
PROCEDURE PrintAvg (x: real; y: real);
PROCEDURE FindChar (target: char; terminator: char;
  max: integer);
FUNCTION Xor (p: boolean; q: boolean) : boolean;
FUNCTION Power (x: real; n: integer): real;
FUNCTION Prime (num: integer): boolean;
```

If two or more formal parameters of the same type appear successively, the list may be abbreviated:

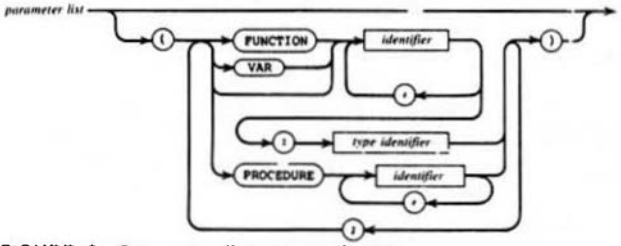


FIGURE 6 Parameter list syntax diagram.

VALUE PARAMETERS

Pascal supports four kinds of parameters, listed in Table 7. The examples above have shown only *value parameters*. When a value parameter is specified, the actual parameter in the procedure call may be any expression whose result is the same type as the formal parameter. The simplest example of such an expression would be a constant or variable of the proper type. When the procedure is called, the expression is evaluated and the resulting value is *copied* into a parameter area and passed to the procedure. Copying takes place even if the result is a large structured type such as an array. The procedure may modify the formal parameter via assignment statements, but this affects only the copy stored in the parameter area. For example, the program shown in Table 8 computes the value of n^2 for each n. When Fact is executed, the value of n is not disturbed even though the copy of n in the parameter area is eventually decremented to 1.

VARIABLE PARAMETERS

Value parameters are the appropriate choice for passing inputs to a procedure or function. However, it is often necessary for a procedure to pass output results to the caller by using one or more parameters. A classical example of this requirement is the swapping procedure shown in Table 9. The Swap procedure declares *variable parameters* x and y. When a variable parameter is specified in a Pascal procedure or function, the actual parameter used in calls must be a *variable* of the corresponding type. The *address* of the variable, not a copy of its value, is passed to the procedure, and all statements in the procedure manipulate the variable directly. Thus, the program in Table 9 does actually swap the values of a and b and prints "2 1". If value parameters were used in the procedure definition, the program would print "1 2".

PROCEDURE AND FUNCTION PARAMETERS

Pascal also allows procedure and function names to be passed as parameters. Table 10 gives a contrived example of a "using-procedure" that accepts the name of a "passed-procedure" as a parameter. Procedures and functions are seldom used as parameters in Pascal, but when they are, several precautions must be observed:

- If a passed-procedure has parameters, they may only be value parameters.
- Only a procedure or function name is passed, not its parameters; therefore the parameters must be "filled in" by the using-procedure.
- The compiler does not necessarily check that the number of parameters required by passed-procedure equals the number of parameters assumed in the definition of the using-procedure.

PARAMETERS IN OTHER HIGH-LEVEL LANGUAGES

Parameter-passing conventions in other high-level languages may be similar to or different from Pascal's. For example, Algol has two methods. The *Algol Call by Value* method handles parameters just as Pascal handles value parameters. The *Algol Call by Name* method has no equivalent in Pascal. It is defined to have the same effect as a textual substitution of the actual parameters for the corresponding formal parameters in the subroutine; this is called the *Replacement Rule*. Although this method allows procedures like Swap to be written in the same way that Pascal would use variable parameters, it is still somewhat different. For example, consider the effect of the replacement rule on the procedure body of Swap if next is an array of integers and we call Swap(i,next[i]):

```
t := i; i := next[i]; next[i] := t
```

The apparent intent of the call is to swap the values of i and next[i]. However, suppose that i=5, next[5]=4, and next[4]=0. Then calling Swap(i,next[i]) sets i to 4 (OK) while setting next[4] to 5 (wrong—we wanted to set next[5] to 5).

The *Fortran Call by Value* method is similar to Pascal and Algol Call by Value, except that the (possibly modified) value in the parameter area is copied back into the original actual parameter when the subroutine is completed. PL/1 has a method called *Call by Reference* which is similar in effect to the use of a Pascal variable parameter, except that it also allows an expression to be used as the actual parameter, temporarily allocating variable storage for the value of the expression.

TABLE 1 Pascal program to simulate a simple adding machine.

```
PROGRAM AddingMachine (input,output);
{ This program simulates a simple adding machine with
  13 keys:
     0-9  Digits -- entered one digit at a time,
          left-to-right.
     C    Clear -- sets the accumulated sum to zero.
     +    Plus -- adds current number to current sum.
     S    Stop -- stops the program.
  The keys are simulated by reading characters one at
  a time from the input.  The current number and sum
  are printed after each C, +, or S operation.
  Illegal characters clear the sum and current number. }

VAR
  sum, number : integer;  charIn : char;

PROCEDURE PrintNums;
{Print current number and sum so far.}
  BEGIN writeln (number,sum) END;

PROCEDURE InitNums;
{Clear current number and sum and print them.}
  BEGIN sum := 0;  number := 0;  PrintNums END;

FUNCTION DigitVal (c : char) : integer;
{Evaluate a digit from 0 to 9.}
  BEGIN
    { The value of a digit is the value of its
      numeric character code minus the value
      of zero's numeric character code.       }
    DigitVal := ord(c) - ord('0');
  END;

BEGIN  {Main Program}
  {Initialize variables; get first char.}
  InitNums;  read(charIn);
  WHILE charIn <> 'S' DO
    BEGIN   {Read a character at a time.}
      {If charIn is a digit, multiply current number
       by 10 and add the digit's value.              }
      IF (charIn>='0') AND (charIn<='9') THEN
        number := number*10 + DigitVal(charIn)
      {Clear sum on 'C'.}
      ELSE IF charIn='C' THEN InitNums
      ELSE IF charIn='+' THEN {Add on '+'}
        BEGIN sum := sum + number;  PrintNums;
              number := 0;  END
      {Clear sum and number on bad inputs.}
      ELSE InitNums;
      read(charIn);  {Always get next char.}
    END;
  writeln('All done -- bye');  {Stop on 'S'.}
END.
```

TABLE 2 Examples of scope rules for procedures.

```
PROGRAM ScopeRules (input,output);
VAR common, maxi : integer;

PROCEDURE ProcA;
VAR temp, x : integer;
  BEGIN
    ...
    x := maxi;  {uses global 'maxi'}
    common := temp + x;
      {global 'common', local 'temp', 'x'}
  END;

PROCEDURE ProcB;
VAR maxi, mini : integer;
  BEGIN   {'maxi' redefined locally}
    ...
    mini := maxi; {OK -- 'mini' and 'maxi' both local}
    temp := 0; {error -- 'temp' undefined
                  in current scope          }
    ...
  END;

BEGIN
  read(common,maxi);  {OK -- both globals}
  temp := 10; {error -- 'temp' undefined
                in current scope          }
  ...
END.
```

Table 2 shows some examples of the scope rules. The global variables common and maxi are used within the scope of procedure ProcA. However, the global variable maxi is redefined within the scope of ProcB. The variable temp, which is local to ProcA, is erroneously used in ProcB and in the main program. Although the scope rules allow multiple uses of the same identifier, it is still best for clarity and correctness to use unique identifier names in different procedures.

TABLE 3 Pascal program to remove spaces from input text.

```
PROGRAM RemSpace (input,output);
{Remove spaces from input text terminated by a period.}
VAR inChar : char;
BEGIN
  REPEAT
    REPEAT read(inChar) UNTIL inChar <> ' ';
    write(inChar);
  UNTIL inChar = '.';
END.
```

TABLE 4 Removing spaces with a procedure.

```
PROGRAM RemSpaceProc (input,output);
VAR inChar : char;

PROCEDURE SkipSpaces;
  BEGIN
    REPEAT read(inChar) UNTIL inChar <> '
  END;

BEGIN
  REPEAT
    SkipSpaces;
    write(inChar);
  UNTIL inChar = '.';
END.
```

TABLE 5 Program to compress strings of spaces.

```
PROGRAM Compress (input,output);
{ Compress a series of spaces in
  input text terminated by a period.}
VAR inChar : char;

PROCEDURE SkipSpaces;
  { A series of 1 to 26 spaces is translated into '@'
    followed by a character between 'A' and 'Z'.
    Longer series are truncated.                    }
  VAR scnt : integer;
  BEGIN
    scnt := -1;
    REPEAT
      read(inChar); scnt := scnt + 1;
    UNTIL inChar <> ' ';
    IF scnt > 26 THEN scnt := 26;
    IF scnt > 0 THEN write('@',chr(ord('A')-1+scnt));
  END;

BEGIN
  SkipSpaces;
  WHILE inChar <> '.' DO
    BEGIN write(inChar); SkipSpaces END;
END.
```

TABLE 6 Removing spaces with a function.

```
PROGRAM RemSpaceFunc (input,output);
{Remove spaces from input text terminated by a period.}
VAR inChar : char;

FUNCTION NextNonspace : char;
  VAR tempChar : char;
  BEGIN
    REPEAT read(tempChar) UNTIL tempChar <> ' ';
    NextNonspace := tempChar;
  END;

BEGIN
  REPEAT
    inChar := NextNonspace; write(inChar);
  UNTIL inChar = '.';
END.


PROCEDURE PrintAvg (x,y : real);
PROCEDURE FindChar (target,terminator: char;
  max: integer);
FUNCTION Xor (p,q : boolean) : boolean;
```

Formal parameters may appear in any order and parameters of the same type need not be grouped together. However, when a procedure or function is called, the actual parameters must be listed in parentheses in the same order as in the definition:

```
VAR
  a,b : real; i,j,len : integer;
  f1,f2,f3 : boolean;
BEGIN
  ...
  PrintAvg(a,b);
  FindChar('t','.',len);
  f3 := Xor(f1,f2);
  a := Power(a*b,i+j);
  f1 := Prime(j+1);
  ...
```

TABLE 7 Kinds of parameters in Pascal.

Kind of Formal Parameter	Syntax	Required Actual Parameter	Effect of Assignment in Procedure
value	identifier : type	expression	local
variable	VAR identifier : type	variable	variable changed
procedure	PROCEDURE identifier	procedure name	not allowed
function	FUNCTION identifier : type	function name	not allowed

TABLE 8 Factorial and square program.

```
PROGRAM FactorialsAndSquares (input,output);
VAR n : integer;

FUNCTION Fact (i : integer) : real;
  VAR prod : real;
  BEGIN
    prod := 1;
    WHILE i>1 DO BEGIN prod:=prod*i; i:=i-1 END;
    Fact := prod;
  END;

BEGIN
  read(n);
  WHILE n>0 DO   {Pass a copy of n to Fact}
    BEGIN writeln(n,Fact(n),n*n); read(n) END;
END.
```

TABLE 9 Program using a swapping procedure.

```
PROGRAM Swapping (input,output);
VAR a,b : integer;
PROCEDURE Swap (VAR x,y : integer);
  VAR t : integer;
  BEGIN t := x; x := y; y := t END;

BEGIN
  a := 1;  b := 2;
  Swap(a,b);  {Pass addresses of a,b to Swap}
  write(a,b);
END.
```

TABLE 10 Program with procedures passed as parameters.

```
PROGRAM ArrayProcs (input,output);
CONST len = 80;
TYPE cNum = 1..len;
VAR charBuffer : ARRAY [1..len] OF char;

PROCEDURE DoBuff (PROCEDURE proc); {Using-procedure'}
  VAR i : integer;
  BEGIN FOR i := 1 TO len DO proc(i)  END;

PROCEDURE Init (i : integer); {'Passed-procedure'}
  BEGIN  charBuffer[i] := ' '  END;
```

```
PROCEDURE Readc (i : integer); {'Passed-procedure'}
  BEGIN  read(cherBuffer[i])  END;

PROCEDURE Printc (i : integer); {'Passed-procedure'}
  BEGIN  write(cherBuffer[i])  END;

BEGIN
  DoBuff(Init);
  DoBuff(Printc); {Print a blank line.}
  writeln;
  DoBuff(Readc); {Read and print a line.}
  DoBuff(Printc);
END.
```

The moral of the foregoing discussion is that a programmer must thoroughly understand the parameter-passing convention of a particular high-level language before writing any procedures that assign values to parameters. Fortunately for our purposes, Pascal variable and value parameters correspond nicely to the parameters most frequently used in assembly language subroutines. Value parameters correspond to numbers, characters, or other values passed to a subroutine, while variable parameters correspond to pointers or addresses.

REFERENCES

The history of subroutines and related concepts has been traced by D. E. Knuth in *Fundamental Algorithms* [Addison-Wesley, 1973 (second edition), pp. 225-227]. Techniques for passing parameters in high-level languages are thoroughly discussed in *Programming Language Structures* by Organick, Forsythe, and Plummer [Academic Press, 1978].

In Part 2 we'll discuss assembly language parameter-passing methods and relate them to the conventions in Pascal.

DATAMAN

DATAMAN—A DATABASE MANAGEMENT SYSTEM By Dale L. Puckett

DATAMAN is a new database management system for FLEX based 68XX systems distributed by FRANK HOGG LABORATORY, Inc. It is written in TSC Extended Basic.

A 'SYSTEM.GEN' file is used to define system terminal and printer control codes. It works with a teletype, a memory-mapped video board like the GIMIX 80 X 24, or a standard CRT like the CT-82. If the system terminal has some cursor control, ie, Home Up and Erase to End of Frame or direct X-Y addressing, two headers are used. One is called a 'Program Header,' the other, an 'Action Header.' These headers use the top four lines and are almost always on the screen.

The 'Program Header' contains the module name of the DATAMAN program being run as well as the version number and date of the last revision of the program. This is nice feature because you always know where you are. The 'Action Header' tells you what information is being displayed, prompted for, or what the computer is doing. It is a nice touch.

The 'SYSTEM.GEN' file allows you to use just about any printer. It supports the 80 and 132-column printers as well as the new models that change from 10 to 16.7 characters per inch under software control. It also supports expanded print for line headers.

While the idea of using a system file to pass hardware parameters is not new, it is a time saver when you change peripherals. Instead of changing a lot of code in every module, you need only create a new 'SYSTEM.GEN' file.

HOW DATAMAN WORKS

The system has 16 program modules and a Menu. Each module does a different task and is selected from the menu. When a function is finished, the menu reappears. The programs prompt in a logical order, making the system very easy to use. This is important when DATAMAN is used by secretaries.

The basic concept used here is one of 'record assignment.' Each record contains a 'Record Code' flag. This flag tells whether the record is 'selected' or 'deleted'. By using it, you can choose the records you wish to process. The flag also marks records containing errors. Almost every module asks you if you wish to use only the flaged records or the entire database.

Most database systems require you to name the records to be used when running an application program. Here, the database can be checked to make sure the correct records were flaged before running program modules. This is a time saver when you must run a database through a number of program modules.

A brief description of DATAMAN program modules follows.

DATAMAN MENU

To enter DATAMAN, BASIC is loaded and the program '0.DATAMAN.BAC' is 'RUN'. The menu 'CHAINs' additional modules. All modules chain back to the menu.

DATABASE CREATE

You can create a new database from scratch or use an existing one. First, you enter the filename (8 letters or less), the drive number, and password. You then give a short description of the database. DATAMAN will prompt for the number of fields, and a name for each label field. You then indicate the type of data for each field, ie, alpha, numeric, money or date. Finally, you must specify the number of characters allowed in the field.

After this information is typed, you may review it, edit it or start entering data. Data input is continued until 'STOP' is typed in the first field.

Each database uses two files with the same name. One has a '.DAT' extension, the other, a '.SPC'. The '.SPC' or specification file contains the header information, the password, and the date and time the file was created or last updated. The '.DAT' file is pure data.

FILE MAINTENANCE

Data is edited with this program. First, the file name, drive number, and password are typed and the password is checked. DATAMAN prompts for the current time and date but a time/date card may also be used. Sample code and information tells how.

The file maintenance program will act on all records in a database, only selected records, or only deleted records. Editing may be done after a record search by field or all records may be examined and/or edited by a global command. Additional records can be added by an 'APPEND' command.

VERIFY DATABASE

This module checks to make sure all numeric data fields contain only numeric information. When a record is found to have bad data, it is flagged as 'deleted'. Records that pass are flagged as 'selected'. This allows you to use the file maintenance program keyed to 'deleted' records to correct bad data.

DATA DUMP

This program dumps fields in a vertical format. It not only lists the fields and their contents, but also prints the 'record code flag'. It is used to check data input against source documents. Data may be printed in real time or spooled to a disk for later printing.

TSC SORT EDITOR

This module creates a file used by the TSC Sort/Merge package to sort a database. Once the database has been chosen, all the field labels are displayed. You are asked how many keys to sort on (up to 20). On the primary key and each secondary key you are prompted for the field and have a choice of ascending or descending order. After the sort is finished, the DATAMAN menu is 'CHAINed'. At no time do you drop into FLEX.

SELECT/DELETE

This module leads you through the logic decisions needed to delete or select records for use by other modules. It is set up in the beginning of the module for 'and' or 'or' logic and can be re- entered for multiple 'and/or' logic.

LOOKUP PROGRAM

This program allows you to find data fast. It gives you a quick and easy way to lookup information. The results are displayed on your system terminal.

RESTORE FLAG

Sometimes it is necessary to reset the record code flag of every record in a database to 'selected'. This module does this.

REMOVE DELETED RECORDS

This program actually removes 'deleted' records from a database. It can also be used to move records from one database to another. It creates a new database for 'deleted' records.

MERGE DATABASES

This module merges two dissimilar databases. It uses a field from a primary file to key records from a secondary file. For example, if the primary file contains names, social security numbers, and YTD salaries, and the secondary file has SS numbers, addresses, and phone numbers, you can make a new file containing employee names and SS numbers from the primary file, and by using the SS numbers as the key, add the cities and phone numbers from the secondary file.

The new file will have as many records as the primary file. If the key target is not found in the secondary file, a 'NA' is inserted, a message appears and the record is flagged as 'deleted'. This module runs fastest during a one for one merge. It also helps to presort both databases before merging.

REPORT EDITOR

Since most reports are used more than once, this module is used to create a file containing a report format. This '.FOR' file is used to print all reports. The editor prompts for the file to be printed and leads you thru a series of decisions concerning what is to be printed. It supports horizontal reports for both 80 and 132 column printers. You have control over page headings, column headings, and statistical information.

REPORT WRITER

This program loads format files created by the report editor and prints the report. Two lines of page headings are defined with the report editor and a third can be added while running the report writer.

LABEL PRINTER

This module prints labels on standard size address labels. It supports multiple fields and if necessary, the city, state, and zip code can be put one line. This module will print at run-time or allow you to dump the labels to a disk for later printing.

STATISTICAL PACKAGE

This unit allows you to do statistical ayalysis on any database field. The database must be pre-sorted before execution. The program reports up to 25 different statistical values on your terminal or printer.

TEXT PROCESSOR DATA TRANSLATOR

This program is an editor/translator which links DATAMAN files to the TSC Text Processor. It prompts for the number of PR data lines and the DATAMAN field for each line. It allows using a field more than once in a PR file. The standard field delimiter, '>', and the '>>' EOR code are supported. You can use this program to print personalized letters or for report writing, invoice printing and many other types of form printing not possible with most report printing programs.

DATABASE DIRECTORY

This module uses the FLEX 'CAT' utility to list database files, format files, and output files, etc.

WHY SEQUENTIAL FILES?

The speed of a database management system is not always a function of the disk file handling technique. It is a function of many things—what the program is doing, the number of records in the file, the speed of the code, and the speed of your drives.

If you are working with a database containing 20,000 records, such as an inventory, and your application requires real time access and modification, then DATAMAN is not for you! In fact, an ISAM random system would do you little good. I am not making a judgement on file handling, just pointing out that file handling technique is not as important to most applications as it seems at first glance. Features like ease of operation, readability of the manual, as well as good support and program code documentation are just as important as speed.

In fact, the sequential file handling in DATAMAN has some unique advanteges. There are no key files to keep track of and update during file maintenance. Sequential files are also 'self compressing'. This means no wasted disk space. If something goes wrong with your system during a disk 'write' while editing, there is always a backup of the original data until the program is finished.

The most important feature of DATAMAN is a function of it's file handling. DATAMAN does not limit the size of records to 254 or 256 bytes, nor does it limit the number of fields per record.

THE MANUAL

Regardless of the quality of a program, it is not very useful if the manual is hard to understand. The manual supplied with DATAMAN is the best database system manual I've seen. It's written in a form that is easy to follow and interesting to read. It is 166 pages long and comes in a nice 3- ring binder. It is divided into 27 sections including a tutorial on database

management. There is a very interesting example of how DATAMAN data files can be used with the TSC Text Processor to print form letters.

CUSTOMIZING DATAMAN

Of all the Data Base Management Systems I've seen, DATAMAN is the only one that includes the source code for all programs on a disk. The authors have gone out of their way to encourage modification and customization of the system by supplying well documented source code and information about each program in the manual. The source code is not compressed and is easy to follow.

You also get a 'SHELL' program. It includes most of the code and subroutines needed by a DATAMAN module. All you do to write a new module is fill in the blanks, write a little code in the space provided, delete the unused code, renumber, compile, and add the name to the Menu.

CONCLUSION

Priced at $149.95, DATAMAN is a fine database management system. The manual is of a quality rarely seen. The system is well thought out and well written. DATAMAN will fill the needs of just about any personal or small business.

DATAMAN requires 32K of memory, TSC Extended Basic, and the TSC Sort/Merge system for sorting. It is available from the FRANK HOGG LABORATORY, 130 MIDTOWN PLAZA, SYRACUSE NY, 13210. Phone: 315-474- 7856.

NOW, DATAMAN HAS RANDOM FILES

A new add-on package now allows the DATAMAN database management system to create random files from DATAMAN files created earlier with the sequential system.

DATARAND files allow super fast look-up and record editing. They may be converted back to standard sequential DATAMAN files at any time.

The new add-on is easy to use and works with a database of any size. Your records can be any length and you may have as many fields as you need in each record.

With DATARAND you do not need an ISAM key file to search your database. This inexpensive addition to DATAMAN makes the package an excellent tool to use to maintain on-line inventories or real-time directories. The source code is supplied with the package. The price is $49.95.

VINTAGE 6800

VINTAGE 6800 BECOMES DUMB TERMINAL

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With the increased use of telecommunications and the need for modem interface, some of the vintage unmodified hardware needs some help to keep up with newer applications without buying additional equipment. The software defined here can serve as a "shuffler" of ASCII characters between an MP-C control port and a modem/ACIA on port 3, turning the SWTPC 6800 into a dumb terminal.

The hardware configuration this program uses consists of an MP 6800, an AC-30 cassette interface, a CT-1024 terminal, a vintage Bell 108 modem, SOROC keyboard, and a 19-inch B/W TV. Motorola's original monitor MIKBUG® is utilized. Because of the method that MIKBUG® uses to input and output characters, the 1024 should be running at 1200 baud when accessing most systems. However, on systems that allow the user to set the number of nulls after a CR/LF, 300 baud can be used with the proper delay. This allows use of the AC-30 to record all input/output for later review.

Line number 440 of the program forces upper case by a logical "AND" with the ASCII character and a $5F. The Source, for instance, sends lower case, but the CT-1024 cannot handle it. Other applications, like most of the computer bulletin boards, default to lower case, but allow the setting for "upper case only." To accomodate all uses, the program converts any character above an ASCII $5F.

Since this character conversion is only in the modem input routine, a lower case keyboard can be used in the full-duplex mode and the characters are converted for the 1024 as the host computer echoes them.

Since most telecommunications are in the full-duplex mode, line numbers 660 and 670 of the program are used to disable the hardware echo from the MP-C. This initialization is identical to that implemented in MIKBUG® for an "L" command. Also note the local 1024 echo

is turned off for full-duplex operation.

The initialization routine configures the ACIA somewhat out of the ordinary. In the local application, one serial port is shared with a printer and a modem. The printer runs at 1200 baud and the modem at 300 baud. Rather than physically pulling the board to reconfigure the interface to use the modem, line numbers 620 and 640 in the program change the baud rate through software division. The ACIA is initialized with $ØA. This value sets a divide by 64 clock rate (to change from 1200 to 300 baud for the modem), 7 data bits, even parity, and one stop bit. In this application, however, input parity is ignored. This software speed conversion has proven to be handy when switching between say, delays in getting a carrier due to heavy traffic and continuing with a local programming effort.

```
---
PAGE  001   MODEM 2.
00010                       NAM    MODEM    2.0

00020                 *     O. B. WRIGHT
00030                 *
00040                 *     T. N. WRIGHT
00050                 *
00060                 *     5184 SPRINGHILL DRIVE
00070                 *     PENSACOLA, FLA 32503
00080                 *     SOURCE: TCH522
00090                 *
00100                 *
00110                 *THIS ROUTINE SHUFFLES ASCII
00120                 *CHARS BETWEEN A WP-C CONTROL
00130                 *PORT AND A MODEM/ACIA AT PORT5.
00140                 *IT USES MIKBUG 5 & CT-1024 AT
00150                 *1700 BAUD.
00160                 *                    JANUARY, 1981
00170                 *
00180       8004      PIAD    EQU    $8004
00190       800C      ACIA    EQU    $800C
00200       E1AC      INIT    EQU    $E1AC
00210       E101      OUTF    EQU    $E101
00220                 *
00230                 *
00240                         ORG    0,$0B
00250 0100                    ORG    $0100
00260 0100 8E A07F            LDS    #$A07F
00270 0103 BD 013F            JSR    INIT
00280 0106 CE 8004            LDX    #PIAD
00290 0109 A6 00    START     LDA A  0,X
00300 010B 2B 05              BMI    MODIN
00310 010D BD E1AC            JSR    INEI
00320 0110 20 21              BRA    MODOUT
00330 0112 F6 800C  MODIN     LDA B  ACIA
00340 0115 57                 ASR B
00350 0116 24 F1              BCC    START
00360 0118 B6 8009            LDA A  ACIA+1
00370                 *DISCARD PARITY BIT
00380 011B 84 7F              AND A  #$7F
00390 011D 81 0A              CMP A  #$0A
00400 011F 27 0B              BEQ    FOR
00410 0121 81 60              CMP A  #$60
00420 0123 23 07              BLS    UPCASE
00430                 *FORCE UPPER CASE FOR 1978
00440 0125 84 5F              AND A  #$5F
00450 0127 BD F101  UPCASE    JSR    OUTF
00460 012A 20 00              BRA    START
00470 012C BD F101  FOR       JSR    OUTF
00480                 *FORCE FOR LF OR CR
00490 012F B6 15              LDA A  #$15
00500 0131 20 F4              BRA    UPCASE
00510 0133 F6 800C  MODOUT    LDA B  ACIA
00520 0136 57                 ASR B
00530 0137 57                 ASR B
00540 0138 24 F9              BCC    MODOUT
00550 013A B7 8009            STA A  ACIA+1
00560 013D 20 D5              BRA    MODIN
00570 013F 8E 33    INIT      LDA A  #$13
00580                 *DIVIDE BY 64 CLOCK
00590                 *SET 7 DATA BITS, 1 STOP
00600                 *EVEN PARITY--NOTE: DOES
00610                 *NOT CHECK INPUT PARITY
00620 0141 CE 0A              LDA A  #$0A
00630 0143 B7 800C            STA A  ACIA
00640 0146 B7 800C            STA A  ACIA
00650                 *INITIALIZE VDUS PRNTR
00660 0149 B6 3C              LDA A  #$3C
00670 014B B7 8007            STA A  PIA+3
00680 014F 39                 RTS

00690 A046                    ORG    $A046
00700 A046 7100               FDB    $0100
00710                         END
```

AVOID PROOFING

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Proofreading a hand entered 6800 machine language program often takes longer than entering the program. A "corrected" program usually contains errors that were not detected. The program in Figure 1 can be used to proofread another program for accuracy.

The program that is to be corrected must be entered two times. First the program is entered in the consecutive memory locations that it will occupy when it is corrected. Then the program is entered again in any other consecutive memory locations that do not overlap the original locations. It is usually desirable to start the two versions of the program in memory locations that have the same numbers for the last two (preferably three) hexadecimal places. For example, if the first version of the program starts in memory location 6011, the second version of the program could start in memory location 9011.

Figure 1 shows the proofreading program in memory locations 0100 through 0122. Any consecutive memory locations that do not overlap with the two versions of the target program can be used. The proofreading program is used to compare the two versions of the program memory location by memory location.

Memory locations 00AA through 00AF are used for temporary data storage. The number of bytes in the program to be proofread is placed in memory locations AA (high) and AB (the number of bytes is entered as a hexadecimal number). If memory location AA contains 00 and location AB contains 29, the two versions of the program are 29 (hex) bytes long. The hexadecimal starting location of the first version of the program is placed in memory locations AC (high) and AD (low). The hexadecimal starting location of the second version of the program is placed in memory locations AE (high) and AF (low).

When an error is detected, the location of the bytes that do not correspond are placed in memory locations AC through AF. For example, if memory location AC contains 60 and memory location AD contains 42, the first version of the program has a potential error in memory location 6042. If memory locations AE and AF contain 90 and 42, the second version of the program has a potential error in memory location 9042.

After an error is detected the version of the program with the error is corrected and the program in Figure 1 is restarted. This procedure is continued until no further errors are detected. When the two versions of the Program are identical, memory locations AA and AB will contain 00.

NUMBER OF BYTES TO BE COMPARED — 00AA high byte, 00AB low byte
STARTING LOCATION OF FIRST PROGRAM — 00AC high byte, 00AD low byte
STARTING LOCATION OF SECOND PROGRAM — 00AE high byte, 00AF low byte

Figure 1. Program to Compare (Proofread) Two Programs

```
Hexa-
decimal                        Op.
Address Contents  Label  Code  Operand  Comments

0100    DE AC     NEXT   LDX   AC       LOC. OF BYTE IN PROG. 1
0102    E6 00            LDA   0,X00     BYTE IN PROGRAM 1
0104    08               INX             PREPARE FOR NEXT BYTE
0105    DF AC            STX   AC       SAVE LOC. FOR NEXT BYTE
0107    DE AE            LDX   AE       LOC. OF BYTE IN PROG. 2
0109    A6 00            LDA   A,X00     BYTE IN PROGRAM 2
010B    08               INX             PREPARE FOR NEXT BYTE
010C    DF AE            STX   AE       SAVE LOC. FOR NEXT BYTE
010E    11               CBA               ARE TWO BYTES IDENTICAL?
010F    26 07            BNE   ERROR    IF NOT, BRANCH
0111    DE AA            LDX   AA       NUMBER OF BYTES TO COMP.
0113    09               DEX             CORRECTED BYTES TO COMP.
0114    DF AA            STX   AA       SAVE BYTE TO COMPARE
0116    26 E8            BNE   NEXT     BRANCH IF NOT FINISHED
0118    DE AC     ERROR  LDX   AC       LOC. OF ERROR + 1
011A    09               DEX             CORRECT ERROR LOCATION
011B    DF AC            STX   AC       SAVE ERROR LOCATION
011D    DE AE            LDX   AE       LOC. OF ERROR + 1
011F    09               DEX             CORRECT ERROR LOCATION
0120    DF AE            STX   AE       SAVE ERROR LOCATION
0122    7E ___           JMP   MONITOR RETURN TO MONITOR
```

BIT Bucket

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T.S.C. BASIC

I have a tid-bit, for people like me, who like to poke around in object software. To keep you from doing this T.S.C. went to a lot of trouble to code their command table. In most basic's a simple ascii list of the object code will reveal the command table's location. Keywords like PRINT, LIST etc will stand out in an ascii list. Not so in all T.S.C. basic's that I have seen. To get a clear ascii print you must divide by two and add thirteen (Hex $D). One way to do this is to make a simple table for conversion. Just list the alphabet down one side of the page. On the other start with hex 68 (A) and skip two for each character(68 6A 6C 6E 70 etc for A B C D E etc).

Just to prove that there are exceptions to all rules (including this rule) this does not apply to the T.S.C. Micro-Basic-Plus that they furnished with source.

I am including a simple BASIC program to do the decoding. About all it will be good for is to locate the command table but does demonstrate the decoding principle.
Happy Hunting!

```
10 INPUT "STARTING ADDRESS? ";M
20 INPUT "ENDING ADDRESS? ";N
30 FOR X=M TO N
40 Z=PEEK(X): REM GET THE CHARACTER
50 Y=Z/2+13 :REM DE-CODE THE CHARACTER
60 IF Y<48 THEN 80:REM GET RID OF NON PRINTABLE CHARS.
70 PRINT CHR$(Y);:REM PRINT THE DECODED CHARACTER
80 NEXT X
```

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DYNASOFT PASCAL RELEASE 1.2

I recently received a copy of Pascal from Dynasoft (release 1.2). Since it was set up for tape I/O the first thing that I wanted to do was to make it work with my disks.

I found it very easy to convert because Dynesoft provided a patch for the JPC cassette system. This located the tape save and load routines of the Pascal program and also identified the pointers for the workspace RAM

I was able to place my disk patches in the same memory and was able to include a prompt for the file you want to use.

To use, the "L" or "S" commands are entered the same as the original, the patch will respond with "NAME?". Enter the file name desired. Default is number one drive and .TXT extension. I have been able to only use the program with TEXT files. My reading, to date, has not made it clear whether or not I should be able to save the compiled code or not. Perhaps some reader can let me know on this point. What I am doing is loading the text file and them compiling it each time I want it to run.

In doing this patch serendipity struck! The TSC Editor worked fine with the Pascal. No changes necessary. I have been using the TSC Editor for some time and prefer to use it although the Pascal contains it's own Editor. Suit yourself on this part. Use either one that you wish. If you call an existing program from disk and use the built in editor to change it, then wish to save the changed version, it will be necessary to give the changed program a new name since the program already exists. This will have the same effect as the TSC system of assigning .BAK to the old files, but can also result in several versions exisiting on disk and you forgetting which is the last one.

The program is also arranged so one could, for instance, patch only the save portion, load an existing program from tape and the save it to disk making an easy way to convert any existing files from tape to disk.

To date, I am trying to learn how to program in PASCAL and the fact that I was able to make these patches only proves that I know some assembler not Pascal. I hope this will encourage people to get started in Pascal as the Dynasoft package is quite cheap.

```
*
            OPT   PAG
            TTL   FLEX 2.0 TO PASCAL 1.2 PATCHES
*
* by Garry O Caudell
* 3125 Robin Lynn Dr.
* Ashland, Ky 41101
*
* 606-324-7225 Phone No.
*
* PATCHES TO ALLOW DYNASOFT PASCAL 1.2 TO USE
* FLEX DISK FILES.  NOTE: TSC EDITOR WORKS FINE
* WITH THIS COMPILER.
*
* TO SET UP ASSEMBLE THIS PATCH INTO A BINARY
* FILE, APPEND IT TO PASCAL AND MAKE THE RESULT
* A COMMAND.
*
```

```
* PATCHES TO ALLOW DYNASOFT PASCAL 1.2 TO USE
* FLEX DISK FILES.  NOTE: TSC EDITOR WORKS FINE
* WITH THIS COMPILER.
*
* TO SET UP ASSEMBLE THIS PATCH INTO A BINARY
* FILE, APPEND IT TO PASCAL AND MAKE THE RESULT
* A COMMAND.
*
* I/O  +++APPEND,PASCAL.BIN,PATPAS.BIN,PASCAL.CMD
*
* USE THE SAME AS BEFORE. WHEN YOU TYPE EITHER A
* "L" OR A "S" PASCAL WILL RESPOND WITH NAME.
* TYPE IN THE NAME OF THE FILE AND CARRIAGE
* RETURN.  THE FILE WILL BE LOADED OF SAVED.
*
* PASCAL EQUATES
*
0020        WS      EQU   $20       WORKSPACE START
0022        EOI     EQU   $22       END OF PROGRAM
0043        XSAVE   EQU   $0043
*
*     FLEX 2.0 EQUATES
*
AD2D        GETFIL  EQU   $AD2D
AD3F        RPTERR  EQU   $AD3F
AD1E        PSTRNG  EQU   $AD1E
AD15        GETCHR  EQU   $AD15
AD1B        INBUFF  EQU   $AD1B
A840        FCB     EQU   $A840
AD33        SETEXT  EQU   $AD33
AD03        WARMS   EQU   $AD03
B406        FMS     EQU   $B406
B403        FMSCLS  EQU   $B403
*
*
* PATCHES TO THE TAPE SAVE PORTION OF PASCAL
*
06A7              ORG   $06A7
*
* OPEN FILE FOR WRITE
*
06A7 8D 77        BSR   NAME
06A9 CE A8 40     LDX   #FCB
06AC BD AD 1B     JSR   INBUFF
```

```
06AF BD AD 20          JSR    GETFIL    GET FILE SPECS
06B2 25 27             BCS    ERROR1
06B4 86 02             LDA A  #2        SETUP FOR WRITE
06B6 A7 00             STA A  0,X       STORE IN FCB
06B8 86 01             LDA A  #1        SET EXTENSION TO TEXT
06BA BD AD 33          JSR    SETEXT
06BD BD B4 06          JSR    FMS       GO OPEN FILE
06C0 26 19             BNE    ERROR1
                *
                * SECTION TO SAVE PASCAL TEXT FILE
                *
06C2 DE 20             LDX    WS        GET START OF WORK SPACE
06C4 DF 43             STX    XSAVE     STORE WORKSPACE POINTER
06C6 DE 43      LOOP2  LDX    XSAVE     GET WORKSPACE POINTER
06C8 A6 00             LDA A  0,X       GET BYTE
06CA 9C 22             CPX    EOI       FINISHED END OF FILE POINTI
06CC 27 10             BEQ    RET1      RETURN IF FINISHED
06CE 08                INX
06CF DF 43             STX    XSAVE     SAVE WORKSPACE POINTER
06D1 CE A8 40          LDX    #FCB
06D4 BD B4 06          JSR    FMS       STORE BYTE
06D7 26 02             BNE    ERROR1
06D9 20 EB             BRA    LOOP2
                *
06DB BD AD 3F  ERROR1  JSR    RPTERR
06DE 7E B4 03  RET1    JMP    FMSCLS
06E1 4E        MSG     FCC    /NAME/
06E9 04                FCB    4
                *
                * PATCHES TO THE TAPE LOAD SECTION OF PASCAL
                *
06E6                   ORG    $06E6
                *
                * OPEN TEXT FILE FOR READ
                *
06E6 8D 38             BSR    NAME
06E8 BD AD 19          JSR    INBUFF    GET FILE NAME
06EB CE A8 40          LDX    #FCB
06EE BD AD 2D          JSR    GETFIL    GET FILE SPEC
06F1 25 21             BCS    ERROR2
06F3 86 01             LDA A  #$01      SET EXTENSION
06F5 BD AD 33          JSR    SETEXT
06F8 86 01             LDA A  #$01
06FA A7 00             STA A  0,X       OPEN FOR READ
06FC BD B4 06          JSR    FMS
06FF 26 13             BNE    ERROR2
                *
                * LOAD TEXT FILE TO WORKSPACE
                *
0701 DE 20             LDX    WS        ZERO OUT WORKSPACE
0703 DF 22      LOOP1  STX    EOI       STORE END POINTER
0705 CE A8 40          LDX    #FCB      POINT TO FCB
0708 BD B4 06          JSR    FMS       GET DATA
070B 26 07             BNE    ERROR2
                *
                * THE PROGRAM HAS TO EXIT ON ERROR
                * BUT END OF FILE SHOWS UP AS ERROR
                *
070D DE 22             LDX    EOI       GET ADRESS OF NEXT BYTE
070F A7 00             STA A  0,X       STORE DATA BYTE IN WORKSPACE
0711 08                INX              UPDATE WORKSPACE POINTER
0712 20 EF             BRA    LOOP1
                *
0714 A6 01     ERROR2  LDA A  1,X       GET ERROR
0716 81 08             CMP A  #$08       END OF FILE?
0718 27 03             BEQ    RET2      GOOD RETURN
071A BD AD 3F          JSR    RPTERR    GO REPORT ERROR
071D 7E B4 03  RET2    JMP    FMSCLS    CLOSE FILES AND RETURN
                *
0720 CE 06 E1  NAME    LDX    #MSG
0723 7E AD 1E          JMP    PSTRNG
                *
                       END

NO ERROR(S) DETECTED
```

Electronic Tool Co.

4736 W. El Segundo Blvd./ Hawthorne, California/ 90250/ (213) 644-0113

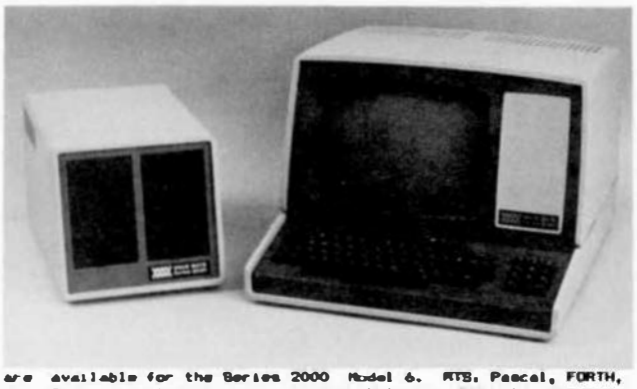
*****FOR IMMEDIATE RELEASE*****

SERIES 2000 Model 6 Computer with dual 720 KB Minifloppies

Electronic Tool Co. has just announced availability of the Wave Mate Series 2000 Model 6 Computing System. First deliveries for the Series 2000 Model 6 are scheduled for April, 1981. The Model 6 is the most advanced member of the Series 2000, which has been in production since mid-1980.

The Series 2000 Model 6 is a compact and efficient computer system which includes a high-quality 25x80 CRT display, full ASCII keyboard with many special function keys for user-defined functions, 2 megahertz 68000 CPU, 64K bytes of RAM, integral disk controller, I/O bus, and two 5.25 inch floppy-disks with 720 kilobytes of formatted data storage capacity each. Two additional drives may be added for a total of nearly 3 Megabytes of reasonable on-line storage.

Software support for the Series 2000 is extensive, is tested and time proven, and is organized in a modular fashion which permits the user to adapt and customize the standard software systems into specialized applications with a minimum of manpower and development effort. Four major Operating Systems



are available for the Series 2000 Model 6. MTB, Pascal, FORTH, and FLEX give the user free choice between assembly language development, structured programming, and high-performance interactive data processing capability on the same Wave Mate 2000 system.

The Series 2000 may be configured with internal space, power, and interface for up to 3 I/O modules, which may be etched or wire-wrapped. The system is adaptable to virtually any interface environment, yet possesses the convenience, reliability, and serviceability of a self-contained package. Extensive development, modular construction, and quality component technology ensure the integrity and long-term reliability of the product.

Non-disk and OEM versions of the Series 2000 are also available with 30-day deliveries typical for most configurations. As United States Master Distributor, Electronic Tool Co. provides comprehensive maintenance and consulting support for the Series 2000 line of computer systems. Word-processing, accounting, database management and scientific analysis are the primary applications of the Series 2000.

On Sunday, February 22, 1981 A. B. S. Computer Services in Olympia, Wash. was robbed, and its owners, Henry and LaVerne Rumberger were killed. Following is a partial list of items stolen with serial numbers:

Apple III	128K	001065
Apple II	A2M030	11892
Apple II	48K/A2SA	152415
Apple II	48K	95802
Diak II	w/controller	215227
BMC Monitor		65101709
Sony KB1216 TV		503527
Centronics 737	Printer	12349

Who in their right mind would steal these??

If you discover any of these items, contact: Detective Jones, Olympia, Wash. Police Dept., 206-753-8300.

SWTP Southwest Technical Products Corp

April, 1981

NEWSLETTER #9

Available for immediate shipment is our new 8212W terminal, the word processing version of the 8212. The "W" version has an industrial keyboard with six user function keys. These keys will work, so you actually have the use of thirty-two function commands from the keyboard. The function keys may be used for other special purpose applications. They use is not limited to word processing. The cursor -numeric pad has been expanded to six user keys so that +, -, *, and / are available to the right of the ten key number entry pad.

This new keyboard uses our new single chip encoder, actually a specially programmed 3870 processor. It can be programmed for six different keyboard styles with one jumper, making the 8212W a true international terminal. The 8212W retails for $1,099.00. All standard 8212 and 8200 terminals will have the new single chip encoder also, but without the added features incorporated in the "W" version.

Shipments have begun on the new 16-64 memory and the 09 computers using this new product. You now can have a single user system with all of the features of the "S" system and full expansion capability at no increase in price. Both only $1,595.00.

Price reductions on 16K static memories have made possible a reduction in the price of our 5-32 static memory board. This product now offers the most versatile static memory around—allowing you to mix ROM, RAM and EPROM in 4K blocks. Now it is also the least expensive static memory on the market, only $495.00 for a full 32K complement. This 2MHz board has a low current consumption of 1.75 amps from a 8.0 volt only power supply. It's the ideal memory board for those process control applications.

We have received our first shipment of Qume "Datatrack 8" drives and will be using them in the D-8's from now on. We have always liked this drive, but did not think a $50.00 premium was reasonable. We have negotiated a contract at a reasonable price and will now be using Qume in all floppy systems. We have always had good service and fast response on problems from Qume, so I think everyone will like the change.

TURNAROUND PLANNING SERVICES

823 BRADWELL
HOUSTON, TEXAS 77062
(713) 488-8187

April 17, 1981

Editor
'68' Micro Journal
3018 Hamill Road
Hixson, TN 37343

Gentlemen,

Out of curiosity, I ran the enclosed Basic program to compare againet Al Moreira's performance timinga (Feb.1981 '68' Micro Journal, Page 14). I ran thie program on my TMS9900, featuring a 3MHz TM9900 Texas Instrumenta 16-bit CPU with hardware multiply and divide, using the enhanced Power Basic interpreter. The timing ? - It took 4h 30min 02eec !

I do have a 6809-based computer syatem on order. I do regret not having bought one instead of thia T.I. computer, which I conaider to be the least cost-effective micro on the market today.

Sincerely,

Richard A. Ertl

```
30  PRINT "LIST OF PRIME NUMBERS"
40  PRINT
50  PRINT 1;2;3;
60  C=0
70  M=3
80  M=M+2
90  FOR K=3 TO M/2 STEP K-1
100   IF INT(M/K)*K-M=0 THEN GOTO 190
110  NEXT K
120  PRINT M;
130  C=C+1
190  IF M<10000 THEN GOTO 80
200  PRINT :: PRINT " C = ";C
220  END
```

```
SIZE
PROM:216 BYTES
VARS:28 BYTES
FREE:23326 BYTES
NEW
```

F & D Associates
1210 TODD ROAD
NEW PLYMOUTH, OHIO 45654

More Computer and Less Money

March 22, 1981

Mr. Don Williams
'68 Micro Journal
3018 Hamill Road, PO Box 849
Hixson, Tennessee 37343

Dear Mr. Williams:

F & D would like to announce the immediate availability of the PAK-1, a general purpose ROM/EPROM board for the Color Computer.

The board accepts up to four 2516, 2716, 2532, 2732 or compatible ROMs giving up to 16k of memory space. No board jumpers are required for the 2k x 8 devices but provision is made for using either DIP switches or jumpers to set up for the 4k x 8 versions. Whether the Color Computer starts up in Basic at Reset or jumps to the program resident on the board is also switch or jumper programmable. The board can be addressed at the normal address of $C000 thru $FFF0 or 2k to 16k starting at $8000. This allows putting in your own program instead of the Basic extension ROM or completely replacing Basic with your own program.

The board keeps unaddressed devices in the "Power Down" mode to conserve power. All bus lines are extended to the end of board where provision is made to mount a receptacle identical to the one in the Color Computer. This allows "daisy chaining" another board onto the PAK-1 as long as power required does not exceed that available. The board is double sided, made from epoxy glass and has plated through holes.

This board and others that we will be releasing, plugs into the ROM PAC slot on the Color Computer. To allow using more than one board at a time, we are working on a buffered "mother board" type of expansion interface. Soon to be released is a prototyping card and under development is an EPROM programmer and some parallel and serial I/O cards. We would like to hear from any of your readers who have interest in, or suggestions for expanding the Color Computer.

The PAK-1 is available from stock at $29.00 plus $3.00 per order shipping. Ohio residents must add 5 percent sales tax.

Sincerely,

David E. Weeks, Pres.

PRODUCT ANNOUNCEMENT

AAA Chicago Computer Center announces their new hardware line which will start out with a heavy gauge chassis and power supply. The cabinet has two cutouts for 5 1/4" disk drives, drive brackets, line cord, line fuse, power switch, reset switch, 70 cfm fan, EMI filter, and 8 RS-232 cutouts. The power supply is rated at 20 amps at 8 volts, 4 amps at 16 volts, and 4 amps at -16 volts. Cost of the cabinet and power supply is $395.00 plus shipping. An optional power supply rated at 30 amps at 8 volts, 10 amps at 16 volts, and 10 amps at -16 volts is available for an additional $100.00. Alternate forms of the cabinet will be available at special request which will have one cutout for a 5 1/4" disk drive, no cutouts, or a taller version for 8" disk drives.

First board offerings will be in bare form and will be in dual serial 30 pin, dual parallel 30 pin, motherboard, and 6809 CPU configurations. Pricing on the bareboards will be announced at a later date.

AAA Chicago Computer Center
120 Chestnut Lane
Wheeling, Il 60090
(312) 459-0450

DENNIS DOONAN
2307 Carlisle Avenue
Racine, Wisconsin 53404
April 9, 1981
(414) 633-7533/632-6602

'68' Micro Journal

3018 Hamill Road
P.O.Box 849
Hixson, Tennessee 37343

Dear Mr. Williams:

Enclosed is a review of SIM-80 from LSI Enterprises. This is an 8080 simulator for 6800 machines. I have found it most helpful.

I hope it meets with your editorial standards for publication. The carbon-ribbon type can be reduced 55% to your format. If you would like another copy to size, I will be happy to supply it.

In case you cannot use this review in the near future, I have enclosed return postage.

Thank you and keep up the good work.

LSI Enterprises SIM-80 Review

SIM-80

Many 6800 users face a similiar problem. There is software published for the 8080 they would like to try. The time and trouble required to translate the source code to another CPU is a major drawback. Others want to learn 8080 machine language programming, but do not want to invest in another system. Some want to design a dedicated controller or system with an 8080 or an 8085, but there is no way to test the software on an existing 6800 system.

LSI Enterprises (P.O.Box 1227, Woodhaven, New York 11421) has a practical solution to these problems. Their SIM-80 is an 8080 simulator which operates on a 6800 system. The program uses less than 3.5 K of memory at either $3000, $7000, or $A300. It is self-contained and requires no additional memory to operate. The package is priced at $34.95 (plus $1.00 shipping) and is available on KC tape, Percom disk, or FLEX 2.0 disk.

SIM-80 is delivered with MIKBUG compatible entry points but it is easily converted to other monitors if the user supplies addresses for terminal input and output, monitor restart, the 6800 stack pointer, and the Input/Output base.

SIM-80 simulates the execution of an 8080 object program on a 6800 machine. It maintains the 8080 registers, program counter, and stack pointer in 6800 memory.

The 8080 object program is first loaded into memory by whatever means are available. This can be a disk or tape dump, output from a cross-assembler, or manually from the control console. SIM-80 is then loaded and run. It contains an optional debugging feature which displays the 8080 registers after each program step. The program being simulated runs 2 to 10 times slower than it would on an 8080 system. Critical timing loops can be called as a 6800 subroutine. An unused 8080 opcode ($20) calls the 6800 subroutine from within the 8080 program. The 8080 registers are transfered to the 6800 registers before execution and are transfered back when the subroutine call is completed. This procedure is also useful for I/O operations and disk or tape calls.

LSI's documentation is concise and clear. It even includes a sample 8080 program to help the beginner get started.

Since the 8080 program initially sets the 8080 stack pointer, care must be taken so it does not overlap the 6800 stack.

The accumulator I/O of the 8080 is handled with an I/O base offset by SIM-80. The 8080's output instruction is OUT xx where xx is the port number of the output device. With SIM-80, the port number is added to the base address. For example, OUT 1C would output the contents of the A register to $801C (assuming the base address is set to $8000). IN xx loads the A register with data from the port number plus base address. This is useful for I/O operations since it is a fast way to access a PIA or ACIA port.

While full 8080 interrupt service is not supported, the RST (restart), EI (enable interrupt), and DI (disable interrupt) instructions are available with SIM-80. EI and DI control the 6800 IRQ bus line. When an interrupt is received, SIM-80 passes control to the 6800 routine pointed to by the interrupt pointer.

The 6800 can regain control in several ways. The 8080 can jump to the system monitor or execute a halt (HLT) instruction. If an undefined opcode is encountered, SIM-80 displays the address of the illegal code and returns to the system monitor.

In short, LSI's SIM-80 package provides an effective low cost way to simulate the operation of an 8080 system.

SOFTWARE DYNAMICS
2111 W. Crescent, Suite G ▲ Anaheim, CA 92801 ▲ (714) 635-4760

March 27, 1981

Mr. Don Williams
'68' Micro Journal
3018 Hamil Road
P. O. Box 849
Hixson, Tennessee 37343

Dear Don:

Just thought I'd add to R. Anderson's comparison of compilers (Flex user notes, Mar '81).

Here's a sample BASIC V1.4 program. To compare against your February table. It occupies 486 bytes (+4x119 bytes per page, and executes in 25 seconds, doing BCD floating point divides, which is by far the slowest routine in our package.

```
REM PRIME NUMBER FINDING PROGRAM FOR BASIC V1.4
REM OC UPTOES $76 (118 DECIMAL) BYTES OF OBJECT CODE
REM EXECUTION TIME IS 25 SE 0800 ON 1MHZ 6800
INPUT "LIMIT? " LIMIT
PRINT "START AT ";TIME$
FOR CANDIDATE=3 TO LIMIT STEP 2 \ I DON'T TRY WITH EVEN NUMBERS
    FOR DIVISOR=3 TO CANDIDATE STEP 2 \ I TRY DIVIDING BY ODD NUMBERS
        LET X=CANDIDATE/DIVISOR
        LET Y=INT(X)
        IF Y<DIVISOR THEN EXIT DIVISOR
        IF X=Y THEN CYCLE CANDIDATE
    NEXT DIVISOR
    PRINT CANDIDATE;
NEXT CANDIDATE
PRINT "DONE AT ";TIME$
END
```

Sincerely,

SOFTWARE DYNAMICS

Ira D. Baxter

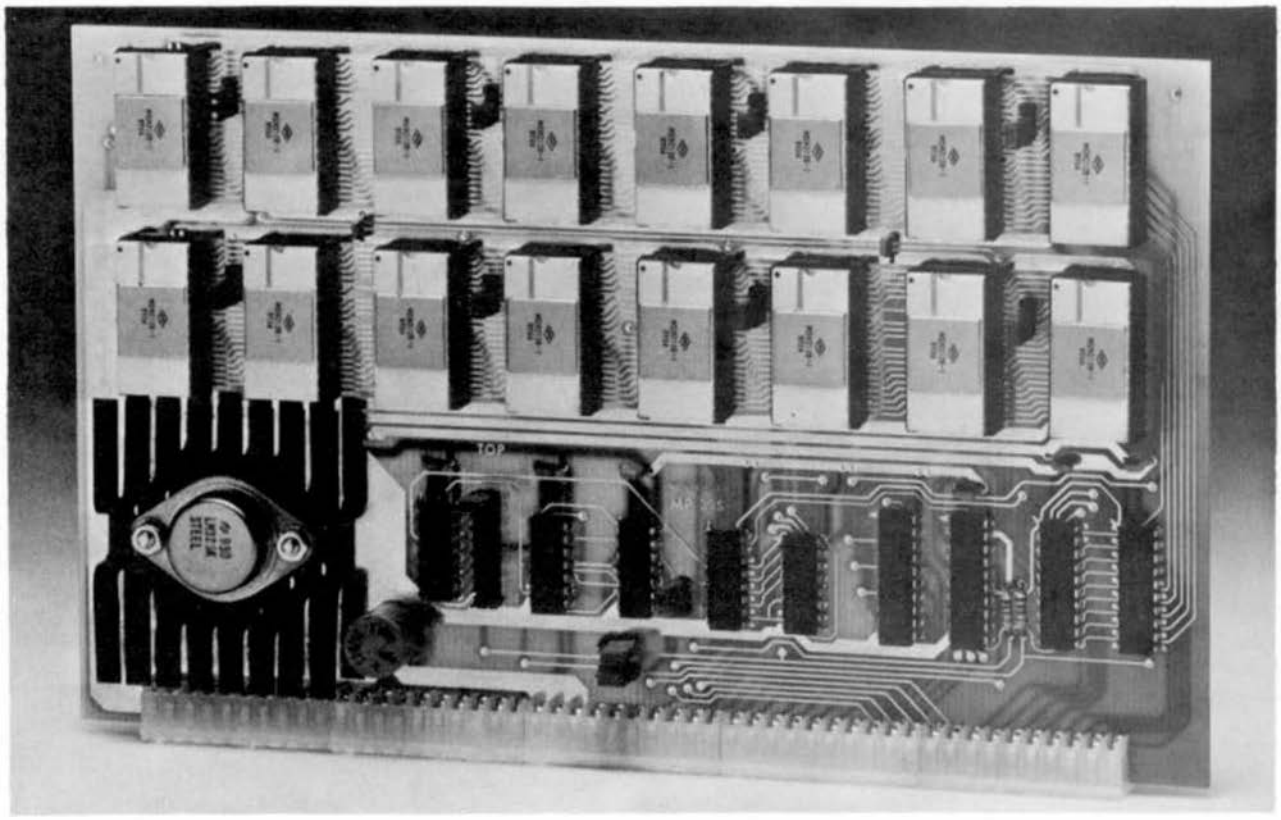
IDB/abs

P. S. EXIT DIVISOR is like GOTO "NEXT DIVISOR"+1.
CYCLE CANDIDATE is like GOTO "NEX CANDIDATE".

Great Plains Computer Company, Inc.
PO Box 916 Idaho Falls, Idaho 83401 Phone (208) 529-3210

6809 RELOCATING LINK-EDITOR
FOR use with
Ed Smith's Software Works (now GPCC)
assemblers, micro-assemblers, & cross-assemblers

GPCC is proud to announce a new 6809 RELOCATING LINK-EDITOR for use with all Ed Smith Software Works (now GPCC) assemblers, macro-assemblers, and cross-macro-assemblers.



UNIVERSAL STATIC MEMORY

★ 32K bytes-ROM, RAM, EPROM or a combination
★ SS-50 A&C compatible with 16 and 20 bit address decoding
★ Compatible with all SWTPC 6800 and 6809 computers
★ 2.0 MHz - 5.0 Volts only

This is the most versatile memory card you can buy. Our S-32 may be populated with up to 32K of static RAM, EPROM, or ROM, or any 4K block combination of these that you may desire. Any 5-volt 2716 pinout compatible memory may be used in this card. Any 4K block of memory may be jumper block programmed for RAM or ROM use. This feature makes this the ideal memory for those process control applications that require a mixture of ROM and RAM memory. The board is fully compatible with all SWTPC 6800 and 6809 computers.

The power requirement for the board is only 1.75 amps at 5.0 volts with a full 32K of RAM installed.

S-32 Circuit card only . . . . . $ 99.50
S3216 with 16K of RAM . . . . . $295.00 ea.
S3232 with 32K of RAM . . . . . $495.00 ea.

SWTPC

SOUTHWEST TECHNICAL PRODUCTS CORPORATION
219 W. RHAPSODY
SAN ANTONIO, TEXAS 78216 (512) 344-0241

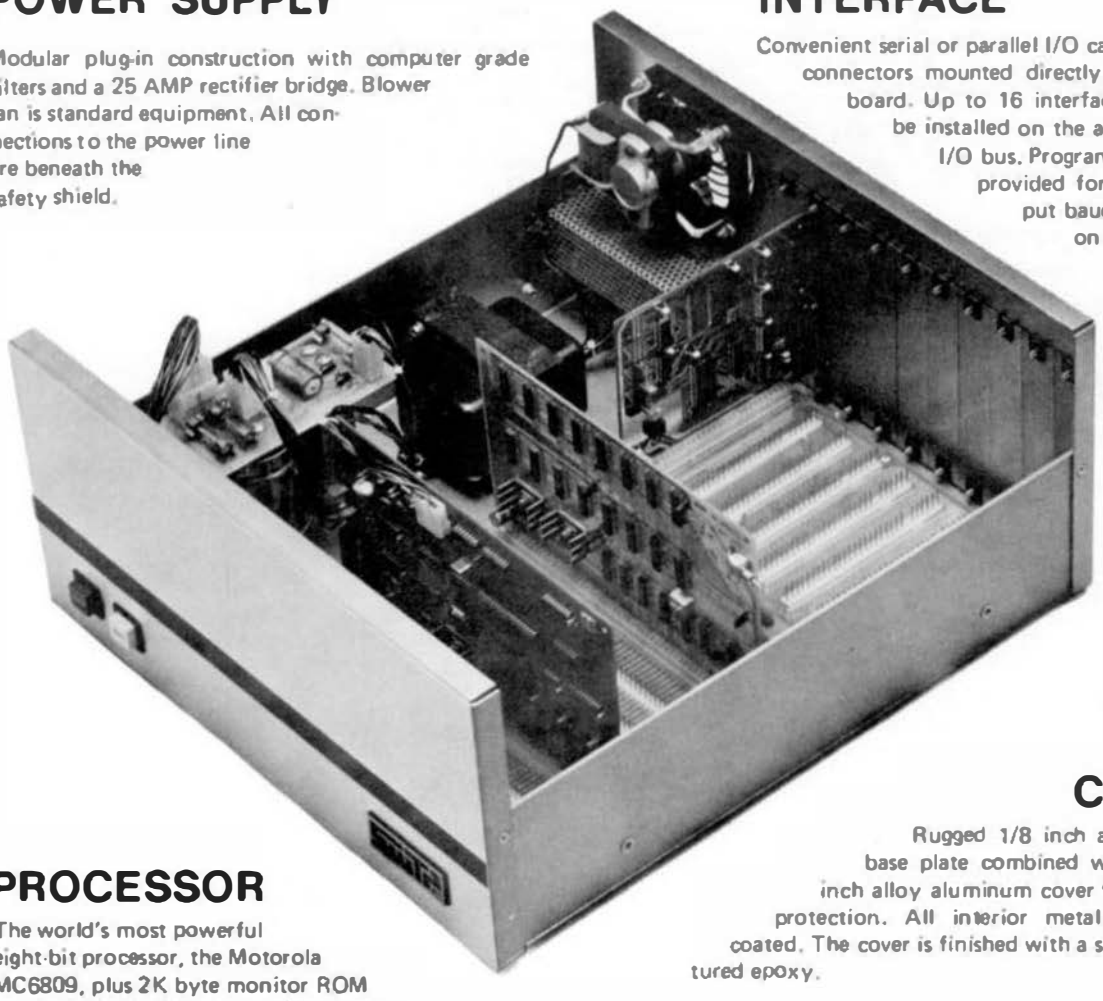
WE HAVE A 6809 FOR YOU

POWER SUPPLY

Modular plug-in construction with computer grade filters and a 25 AMP rectifier bridge. Blower fan is standard equipment. All connections to the power line are beneath the safety shield.

INTERFACE

Convenient serial or parallel I/O cards have DB-25 connectors mounted directly on the circuit board. Up to 16 interface devices may be installed on the address decoded I/O bus. Programming strips are provided for input and output baud rate selection on each port. All outputs are fully buffered.



CABINET

Rugged 1/8 inch alloy aluminum base plate combined with a solid 1/8 inch alloy aluminum cover for unsurpassed protection. All interior metal is conversion coated. The cover is finished with a super tough textured epoxy.

PROCESSOR

The world's most powerful eight-bit processor, the Motorola MC6809, plus 2K byte monitor ROM that is 2716 EPROM compatible and full buffering on all output lines. Built-in multiuser capability, just add I/O cards to operate a multi-terminal system.

MEMORY— You can purchase the computer with either 8K bytes of RAM memory (expandable to 56K), or with the "S" series 64K bytes of RAM memory expandable to 768 K.

PERIPHERALS—The wide range of peripheral hardware that is supported by the 6809 includes: dot matrix printers (both 80 and 132 column), IBM Electronic 50 typewriter, daisy wheel printers, 5-inch floppy disk system, 8-inch floppy disk systems and a 16 megabyte hard disk.

SOFTWARE— The amount of software support available for the 6809 is incredible when you consider that it was first introduced in June, 1979. In addition to the FLEX9 operating system, we have a Text Editor, Mnemonic Assembler, Debug, Sort-Merge, BASIC, Extended BASIC, MultiUser BASIC, FORTRAN, PASCAL and PILOT.

69/K Computer Kit with 8K bytes of memory ..... $ 575.00
69/A Assembled Computer with 8K bytes of memory ..... $ 695.00
09/ Assembled Computer "S" series with 64K bytes of memory $1,595.00

SWTPC

SOUTHWEST TECHNICAL PRODUCTS CORPORATION
219 W. RHAPSODY
SAN ANTONIO, TEXAS 78216 (512) 344-0241

FEATURES

1....PROCESSES FROM DISK TO DISK--The Link-Editor processes and links together one or more relocatable object files and produces a composite, executable file in the standard Flex (tm) binary format. Unlike the original Linking Loader, the Link-Editor does not load files at their final destination during processing, but processes them through a common mail buffer.

2....COMMAND LINE ORIENTED--All operations are directed from the command line--No more prompts to answer. No more searching of the entire disk to resolve references. Only those files specified on the command line or in library files are processed.

3....LIBRARY FILES--Two types of libraries are supported: Forced-load and Optional-load. Both are simply lists of files to be processed. Forced-load means that all files in the library list will be loaded whether needed or not. Optional-load means that only those files from the library list necessary to resolve external references are loaded. Any library file may be used in either mode by simply changing a prefix character on the command line.

4....MIXED FILE TYPES--Any combination of input files and library files may be included on the command line. Individual files will be processed in forced-load mode. Relocatable and non-relocatable files may be intermixed. References between relocatable and non-relocatable modules are correctly resolved.

5....SEVERAL OPTIONS are supported. Entry points, unresolved references and load map may be listed, printed, or output to a file by using the standard Flex commands ("P", "S", "O", "D" etc.).

Flex (tm) is a trademark of Technical Systems Consultants

Price: $35

LIST PROC.DAT

HERE IS AN INTRIGUING LITTLE PRINT OUT FOR YOU. OWNERS OF THE EPSON PRINTER SHOULD BE ABLE TO FIGURE OUT HOW TO DECODE IT. THIS IS FOR SOFTWARE HACKERS ONLY. YOU HARDWARE TYPES WILL NOT BE INTERESTED AT ALL.

DEAR DON,
ﾀﾅﾒｱ ﾉﾓ ﾗﾎ ﾉﾎﾔﾒﾉﾇｺﾉﾎﾇ ﾌﾉﾃﾃﾌｱ ﾐﾒﾉ
ﾎﾔ ﾏｺｱ ﾆﾏﾒ ﾎﾏｺﾛ ﾏﾌﾎｱﾒﾓ ﾏﾆ ﾔﾈﾅﾅﾐ
ﾓﾏﾎ ﾐﾒﾉﾎﾃﾌﾒ ﾓﾈﾏｺﾌﾄ ﾂｱ ﾗﾌﾌｱ ﾓﾏ ﾆ
ﾉﾇｺﾒｱ ﾏｺｱ ﾈﾏﾗ ﾔﾏ ﾄｱｱﾏﾄﾅ ﾉﾃﾎﾔﾈﾉﾓ
ﾉﾓ ﾆﾏﾒ ﾓﾏﾆﾄﾗﾁﾒｱ ﾈﾁﾁﾋﾋｱﾒﾓ ﾏﾎﾌﾛ
ﾎﾏｺ ﾈﾁﾒﾄﾗﾁﾒｱ ﾔﾎﾐﾅﾓ ﾜﾉﾌﾌ ﾎﾏﾃﾂｱ ﾉ
ﾎﾃﾃﾒﾅﾓﾃﾔｱﾄ ﾁﾔ ﾁﾌﾌﾛ
JOHN TUCKER

LIST TRANS2.BAS

```
0010 REM -- CONVERTS ENGLISH SYMBOLS TO JAPANESE SYMBOLS
0020 STRING= 100
0030 OPEN #1, PROC
0040 READ #1,A$
0050 IF EOF(1)=1 THEN GOTO 200
0060 LET B=LEN(A$)
0070 FOR L=1 TO B
0080 LET B$=MID$(A$,L,1)
0090 LET X=ASC(B$)
0100 IF X<21 THEN Y=X:GOTO 140
0110 IF X>20 THEN Y=X+128
0120 IF Y<160 THEN Y=Y+32
0130 IF Y>223 THEN Y=Y-32
0140 PRINT #7;CHR$(Y);
0150 LET Q=Q+1
0160 IF Q=32 THEN PRINT #7
0170 IF Q>=32 THEN Q=1
0180 NEXT L
0190 GOTO 40
0200 CLOSE #1
0210 END
```

DON...I HOPE THIS DOESN'T SPELL ANY DIRTY WORDS!
JOHN

F.G. Marchais
2325 S. Beaufort Dr.
Oxnard Ca. 93030
15 April, 1981

Don Williams Sr.
'68' Micro Journal
3018 Hamill Rd.
Hixson Tennessee 37343

Dear Mr. Williams

here is a short program in SWTPC Mini-Flex basic, ver 2.0, which will format and list a .BAS file from disk. It will print the page number, and file name at the top, indent the left margin to allow insertion in a 'loose-leaf' notebook, and mark the page boundries at 11 inch intervals for cutting.

My system is a 32K SWTPC, with SWAIBUG, dual mini-drives, and a Heathkit H9 terminal, modified for 24 lines per inch. The dot-matrix printer uses 8-1/2 in. roll paper with no perforations.

The CHR$(30) in line 10 sets the printer to 96 column operation. As written, printer output will be on port 0. If you have an 'LREAD' or other equivalent instruction in your version of BASIC, then change line 90 to:

```
0090 LREAD #0,A$
```

Then, delete lines 110 through 150. The purpose of these lines is to avoid truncating A$ when reading commas in the text. If you may be listing programs with more than 5 commas in a line of text. Just add more string fillers under line 150.

Hope this may be of help to someone.

Best regards,

F.G. Marchais

BASLIST

```
0010 LINE= 128:STRING=80:PRINT#0,CHR$(30);
0020 PRINT :PRINT TAB(20);"BASIC PROGRAM LISTER":PRINT
0021 REM
0022 REM
0023 REM BY G. MARCHAIS
0024 REM 2325 BEAUFORT DR.
0025 REM OXNARD CA 93033
0026 REM (805) 487-9518
0027 REM 15 APRIL 1981
0028 REM
0029 REM
0030 INPUT " BASIC PROGRAM TO BE LISTED",B$:P=0:C=0
0040 IF RIGHT$(B$,4)=".BAS" THENB$=LEFT$(B$,LEN(B$)-4)
0050  C$=B$:B$=B$+".BAS"
0060 GOSUB 200
0080 OPEN #0,B$
0090 READ #0,A$,D$,E$,F$,G$
0100  C=C+1:IFC=60 THENGOSUB200
0110 IF D$<>"" THENA$=A$+","+D$
0120 IF E$<>"" THENA$=A$+","+E$
0130 IF F$<>"" THENA$=A$+","+F$
0140 IF G$<>"" THENA$=A$+","+G$
0150 IF H$<>"" THENA$=A$+","+H$
0160 IF EOF(0)=1 THENCLOSE#0:GOTO180
0170 PRINT #0,TAB(10);A$:GOTO90
0180 IF P>1 THENC=C+1
0185 FOR X=C TO 6 :PRINT#0:NEXTX
0190 PRINT #0,"-----------------------------------------------"I
0195 PRINT #0,"-----------------------------------------------":GOTO20
0200  C=0:P=P+1:PRINT#0,"------------------------------------------------------";
0205 PRINT #0,"-----------------------------------------------"
0210 PRINT #0:PRINT#0,TAB(40);"P.";P
0220 PRINT #0:PRINT#0,TAB(40);C$:PRINT#0:RETURN
```

68XX Micro Journal
3018 Hamill Rd.
P.O. Box 849
Hixon TN 37343

Dear Editor:

Line 713 of the program DISKEDIT on page 23 of the April 1981 issue should be changed from:

CLRB to: LDB #2

Without this change, The Search function will not work properly. A reading of Track Ø Sector Ø produces a hardware error and further, will not allow reading of Drive Ø at all.

Other than the above, my compliments on a fine and very useful piece of software.

Sincerely,

Phillip D. Deem
10347 Fairhaven Ct.
Indianapolis IN 46229

P.O.Box 1601
Port Isabel
Texas 78578

Dear Don;

Just in case there are some other folks out there that are using an old SWTPC 6800 and have changed from the CT-1024 to a faster (better) Terminal, and want to run a little faster than 1200 baud. This will put 9600 baud on the 150 baud line, from the old MP-A card for the SWTPC 6800. Cut the trace that runs from the 74L04 to pin 8 of the 14411 baud rate generator, Run a jumper from the 74L04 side of the cut, to pin 1 of the 14411. You now have 9600 baud on the 150 baud line. Of course you can use other rates or other lines, but I had no use for 150 baud,and dont think I will need anything slower than 9600 for my Recently aquired (used) Soroc IQ-120. The next modification will be to take the baud rate from the Soroc and feed it to the MP-S. I would like any information that anyone has on finding the location of the baud rate lines in the Soroc.

Hope this can help some other Dinosaurs.

Jim Caldwell
P.O. Box 1601
Port Isabel Tx 78578

NEWS RELEASE
For Immediate Release

April 21, 1981

6809 GETS WORD PROCESSING DICTIONARY

Lansing, Michigan--The 'Computerized Dictionary' is a new software product from Davidson Software Systems, designed for the SouthWest 6809 micro. This product will aid word processing users by editing text for spelling errors, a company spokesman said. Not only will misspelled words be found; they can be changed automatically.

The 'Computerized Dictionary' is said to operate in two modes for examining text information. In interactive mode, any words not found in the dictionary file are displayed. The operator then has an opportunity to ignore the word, key in a new word to replace it, or if the word is actually correct, add it to the dictionary file. Frequently misspelled words can be automatically changed by the system. For example, whenever the system encounters 'thier' it is changed to 'their'. As users correct their misspelled words, they can optionally instruct the system to thereafter automatically make the change.

In list mode, the spokesman explained, the text will be printed as it is being processed. Any misspelled words are highlighted on the listing. No operator intervention is required when in list mode.

A dictionary file is included with the system, although the user can add words at any time. The spokesman said that programs for maintaining the dictionary files are also included. Words can be added, changed, or deleted from the dictionary with the maintenance programs. The dictionary files can also be listed or displayed. All the system functions are accessed from a menu for operator convenience.

The system comes complete with an installation guide and operations manual, ready to use. For more information, contact Davidson Software Systems at Box 21002, Lansing, Michigan, 48909 or call 517-332-5909.

Released by

Richard E. Davidson, Jr.

TO: Mr. Dan Williams, Sr.
68 MICRO JOURNAL

Riverside Unified School Distri
6660 School Circle
P.O. Box 2600 Riverside, California 9

FROM: William H. Olson
Instructional Media Services

SUBJECT: Word Search/Scramble

Date 12 31 80

Dear Sir:

I am one of your subscribers (6970 Arbor Drive, Riverside, CA. 92504) and in looking at a back issue (or a program (July 1979) I found a word search printout, but no program to go with it. Perhaps you could intercede for me with Mr. Phil Schumm, editor of the '6800 Bits' newsletter for a copy of the listing of this program.

I do have several photocopies of word search programs, but my 6800 BASIC is not at all happy with some of their variables.

Enclosed you will find a set of postage stamps to help in this effort, and a word scramble program and run you might pass on to the gentleman as a trade.

Enjoy your magazine, even though I'm still using KC 300 cassettes rather than floppies for storage.

Thanks again . . .

```
0010 REM : INTERMEDIATE WORD SCRAMBLE ROUTINE
0030 REM : NUMBERS - - WRITTEN 11/8/80  W.H.O.
0100 DIM A(15)
0110 DIM A$(15)
0120 PRINT TAB(25);"WORD SCRAMBLE QUIZ"
0190 PRINT
0200 READ W
0210 FOR R= 1 TO W
0220 PRINT TAB(10);R; TAB(15);
0230 READ N
0240 FOR P = 1 TO N
0250 LET A(P) = 0
0260 NEXT P
0280 FOR P = 1 TO N
0290 LET T= INT(N*RND(0)+1)
0300 LET S = 1
0310 FOR S=1 TO N
0320 IF T = A(S) GO TO 290
0330 NEXT S
0340 LET A(P) = T
0350 READ A$(T)
0360 NEXT P
0410 FOR P = 1 TO N
0420 PRINT A$(P);
0430 NEXT P
0440 PRINT TAB(35);"_____"
0450 PRINT
0460 NEXT R
0999 END
1000 DATA 10,5,G,R,A,P,E,5,A,P,P,L,E,6,O,R,A,N,G,E
1010 DATA 4,P,E,A,R,5,P,E,A,C,H,6,B,A,N,A,N,A
1020 DATA 4,P,L,U,M,7,A,P,R,I,C,O,T,3,F,I,G
1030 DATA 10, G,R,A,P,E,F,R,U,I,T
```

'68' Micro Journal
3018 Hamil Road
P. O. Box 849
Hixson, Tennessee 37343

Gentlemen:

I am enclosing a short FLEX 2.0 utility I recently wrote for possible publication.

Although there is nothing unique about this utility it is a big timesaver when addressing envelopes, or writing short letters when you don't want to go into the editor to do so.

I believe that it is self-explanatory, but I would be glad to assist anyone having trouble in getting it to run on his equipment.

Sincerely,

Ernest Steve Watson

```
                        NAM     PRTRT
                      *A UTILITY FOR PRINTING CAPTIONS, ETC. FROM
                      *THE KEYBOARD WITHOUT USING A TEXT EDITOR.
                      *USER IS PROMPTED TO SPACE BEFORE EACH LINE
                      *ENTRY TO AVOID LOSS OF THE FIRST CHARACTER.
                      *LABELS REFER TO FLEX 2.0 SUBROUTINES UNLESS
                      *OTHERWISE INDICATE .
                      *CONTROL 'C' WILL RETURN THE USER TO FLEX.
A100                  ORG     $A100
AD09            INCH  EQU     $AD09
AD10            OUTCH EQU     $AD10
A800            PCONT EQU     $A800     PRINTER CONTROL
                *MEMORY LOCATION
D080            PRINT EQU     $D080     PRINT DRIVER ROUTINE
AD03            FLEX  EQU     $AD03
AD1B            INBUFF EQU    $A 1B
AD1E            PSTRNG EQU    $AD1E
AC22            SWITCH EQU    $AC22
AD24            PCRLF EQU     $AD24
A080            BUFBEG EQU    $A080
A100            BUFEND EQU    $A100
A100                  ORG     $A100
A100 20 01      START BRA     BEG
A102 01         VERSION FCB   1
A103 CE A1 68   BEG   LDX     #PROMPT
A106 BD AD 1E         JSR     PSTRNG
A109 7F AC 22         CLR     SWITCH
A10C 7F A8 00         CLR     PCONT     TURN PRINTER ON
A10F CE D0 80         LDX     #PRINT
A112 FF AD 10         STX     OUTCH
A115 20 03            BRA     AROUND
A117 73 A8 00   LOOP2 COM     PCONT     TURN PRINTER OFF
A11A BD AD 09   AROUND JSR    INCH
A11D 81 03            CMP A   #03       CONTROL 'C'
A11F 27 33            BEQ     FINISH
A121 BD A 1B          JSR     INBUFF
A124 CE A0 80         L X     #BUFBEG
A127 3C A1 00   LOOP1 CPX     #BUFEND
A12A 27 1F            BEQ     ERROR
A12C A6 00            LDA A   0,X
A12E 81 00            CMP A   #$0D      CK. FOR CR
                *CHECK FOR END OF TEXT
A130 27 03            BEQ     DONE
A132 08               INX
A133 20 F2            BRA     LOOP1
```

```
A135 86 04      DONE    LDA A   #$04
A137 A7 00              STA A   0,X
A139 CE A0 80           LDX     #BUFBEG
A13C BD AD 1E           JSR     PSTRNG
A13F CE A1 68           LDX     #PROMPT
A142 73 A8 00           COM     PCONT
A145 BD AD 1E           JSR     PSTRNG
A148 7E A1 17           JMP     LOOP2
A14B CE A1 5C   ERROR   LDX     #ERR1
A14E 73 A8 00           COM     PCONT
A151 BD AD 1E           JSR     PSTRNG
A154 86 FF      FINISH  LDA A   #$FF
A156 B7 A8 00           STA A   PCONT
A159 7E AD 03           JMP     FLEX
A15C 45         ERR1    FCC     'ERROR-ABORT'
A15D 52 52
A15F 4F 52
A161 2D 41
A163 42 4F
A165 52 54
A167 04                 FCB     4
A168 53         PROMPT  FCC     'SPACE BEFORE ENTERING LINE'
A169 50 41
A16B 43 45
A16D 20 42
A16F 45 46
A171 4F 52
A173 45 20
A175 45 4E
A177 54 45
A179 52 49
A17B 4E 47
A17D 20 4C
A17F 49 4E
A181 45
A182 0D                 FCB     $0D,$0A
A183 0A
A184 4C                 FCC     'LINE?'
A185 49 4E
A187 45 3F
A189 04                 FCB     4
                        END     START
```

'68'Micro Journal.,
3018 Hamill Road.,
Hixson, Tennessee,
37343, U.S.A.

Dear Sirs;-

DUMPFILE.CMD for FLEX09

Please find an enclosed listing of DUMPFILE.CMD for FLEX 09. There was a same program appeared in the Journal. This is 09 version of the program and modified to have Hex and ASCII output lines always starting from adress xxx0. This may let it easier to find each memory address.

Added is a dumped list of the program itself. Blank between $C1DC and $C1DD shows that the two parts came from different sectors on the disk. To make program simpler, I left this part as it is.

If the reader does not have lower case print out on terminal or printer, he has to change $C1B3 7E to the Hex value of upper limit to output.

Yours truly,

K.Mitadera

K.Mitadera
126 Sedgefield,
Pointe Claire,
Quebec CANADA
H9R 1N5

514-694-1643

DUMP-FILE

```
                        * UTILITY TO PRINT OUT DISK CONTENTS
                        * VERSION 3
                        * PRINTOUT ASCII LIST AS WELL AS HEX CODE

                        * DOS EQUATES

CD03            WARMS   EQU     $CD03
CD18            PUTCHR  EQU     $CD18
CD1E            PSTRNG  EQU     $CD1E
CD24            PCRLF   EQU     $CD24
CD3C            OUTHEX  EQU     $CD3C
CD45            OUTADR  EQU     $CD45
CD2D            GETFIL  EQU     $CD2D
CD33            SETEXT  EQU     $CD33
CD3F            RPTERR  EQU     $CD3F

                        * FMS EQUATES

D406            FMS     EQU     $D406
D403            FMSCLS  EQU     $D403

                        * SYSTEM EQUATES

C848            FCB     EQU     $C848

                        * ACTUAL PROGRAM STARTS HERE *
                        ******************************

C100                    ORG     $C100
C100 20 28      START   BRA     INIT
C102 03         VN      FCB     3               VERSION 3

C103            CHRBUF  RMB     1               TEMPORAL STORAGE OF DATA BITE
C104            CTRBLK  RMB     1               NUMBER OF DATA BITE IN BLOCK
C105            XADDR   RMB     2               TRANSFER ADDRESS
C107            APNTR   RMB     2               CURRENTLY POINTING ADDRESS
C109            LINBUF  RMB     16              TEMPO STORAGE OF ASCII OUTPUT

C119 0D0A       MSG     FDB     $0D0A           CR & LF
C11B 54 52 41 4E        FCC     'TRANSFER ADDRESS '
C11F 53 46 45 52
C123 20 41 44 44
C127 52 45 53 53
C12B 20
C12C 04                 FCB     4

                        * INITIALIZE

C12D BE C848    INIT    LDX     #FCB
C130 8D CD2D            JSR     GETFIL          GET FILE SPEC
C133 1025 00E9          LBCS    LISTE2          CHECK FOR ERROR
C137 86 01              LDA     #1              SET UP CODE = READ
C139 A7 84              STA     0,X             SAVE FOR READ
C13B 86 00              LDA     #0              SET 'BIN' EXTENTION
C13D 8D CD33            JSR     SETEXT
C140 8D D406            JSR     FMS             CALL FMS - OPEN
C143 1026 00E9          LBNE    LIST 2          CHECK FOR ERROR
C147 86 FF              LDA     #$FF            SET CODE FOR BINARY FILE
C149 A7 88 3B           STA     59,X            STORE IT IN SUPPRESSION FLAG

                        * READ ADDRESS INFORMATIONS

C14C 17 00C3    LOADER  LBSR    FMS1            GET DATA BITE FROM FILE
C14F 81 02              CMPA    #2              START OF NEW RECORD?
C151 27 21              BEQ     LDR2            IF YES - GO READ START ADDR
C153 81 16              CMPA    #$16            TRANSFER ADDRESS?
C155 26 F5              BNE     LOADER          IF NOT - GET ANOTHER BITE

C157 17 0088            LBSR    FMS1            GET TRANSFER ADDRESS - MSB
C15A B7 C105            STA     XADDR           STORE IT IN XADDR-H
C15D 17 0082            LBSR    FMS1            GET TRANSFER ADDRESS - LSB
C160 B7 C106            STA     XADDR+1         STORE IT IN XADDR-L
C163 8E C119            LDX     #MSG            POINT TO TRANSFER ADDRESS MSG
C166 8D CD1E            JSR     PSTRNG          OUTPUT IT
C169 8E C105            LDX     #XADDR          POINT TO TRANSFER ADDRESS
C16C 8D CD45            JSR     OUTADR          OUTPUT IT
C16F 8D CD24            JSR     PCRLF           OUTPUT CR & LF
C172 20 D8              BRA     LOADER          RETURN TO GET ANOTHER BITE

C174 17 0090    LDR2    LBSR    FMS1            GET START ADDRESS - MSB
C177 B7 C107            STA     APNTR           STORE IT IN APNTR-H
C17A 17 0093            LBSR    FMS1            GET START ADDRESS - LSB
C17D B7 C108            STA     APNTR+1         STORE IT IN APNTR-L

C180 17 008F            LBSR    FMS1            GET NBR OF BITES IN THE BLOCK
C183 B7 C104            STA     CTRBLK          STORE IT IN COUNTER
C186 81 00              CMPA    #0              ARE THERE ANY DATA?
C188 27 C2              BEQ     LOADER          IF NO - GO READ ANOTHER BLOCK

                        * OUTPUT DATA

C18A 8D CD24    OUTDTA  JSR     PCRLF           OUTPUT CR & LF
C18D 8E C107            LDX     #APNTR          POINT TO START ADDRESS
C190 8D CD45            JSR     OUTADR          OUTPUT IT
C193 8D 74              BSR     OUTS            OUTPUT A SPACE
C195 108E C109          LDY     #LINBUF         POINT TO LINE BUFFER
C199 F6 C108            LDB     APNTR+1         LOAD START ADDRESS
C19C C4 0F              ANDB    #$0F            MASK 4 MSB OF IT
C19E 27 0D      OUTDT2  BEQ     OUTDT3          IF LSB = $00 - GO OUTPUT HEX
C1A0 8D 67              BSR     OUTS            IF NOT - OUTPUT 3 SPACES
C1A2 8D 65              BSR     OUTS
C1A4 8D 63              BSR     OUTS
C1A6 86 20              LDA     #$20            AND FILL BUFFER WITH A SPACE
C1A8 A7 A0              STA     0,Y+
C1AA 5A                 DECB
C1AB 20 F1              BRA     OUTDT2          LOOP UNTIL LINE UP
C1AD 8D 63      OUTDT3  BSR     FMS1            GO GET A BITE
C1AF B7 C103            STA     CHRBUF          STORE IT IN BUFFER
C1B2 81 7E              CMPA    #$7E            ASCII CHARACTER?
C1B4 22 04              BHI     OUTDT4          IF NOT - REPLACE BY ASCII
C1B6 81 1F              CMPA    #$1F            CONTROL CODE?
C1B8 22 02              BHI     OUTDT5          IF NOT - STORE AS IT IS
C1BA 86 5F      OUTDT4  LDA     #$5F            REPLACE BY UNDERSCORE
C1BC A7 A0      OUTDT5  STA     0,Y+            STORE IT IN LINE BUFFER
C1BE 34 20              PSHS    Y               SAVE Y
C1C0 8E C103            LDX     #CHRBUF         LOAD DATA BITE
C1C3 8D CD3C            JSR     OUTHEX          OUTPUT BY HEX
C1C6 35 20              PUL.S   Y               RESTORE Y
C1C8 8D 3F              BSR     OUTS            OUTPUT A SPACE
C1CA 8E C107            LDX     APNTR           UPDATE CURRENT BITE ADDRESS

C1CD 30 01              LEAX    1,X             INCREMENTING BY 1
C1CF 8F C107            STX     APNTR
C1D2 7A C104            DEC     CTRBLK          COUNT BITES LEFT IN BLOCK
C1D5 26 05              BNE     OUTDT6          IF ANY - STAY ON IT
C1D7 8D 0E              BSR     OUTASC          IF NOT - GO OUTPUT ASCII
C1D9 16 FF70            LBRA    LOADER          GO INPUT NEW BLOCK
C1DC B6 C108    OUTDT6  LDA     APNTR+1         LOAD CURRENT ADDRESS
C1DF 84 0F              ANDA    #$0F            LSB = $00? LINE IS FULL?
C1E1 26 CA              BNE     OUTDT3          IF NOT - GET ANOTHER BITE
C1E3 8D 02              BSR     OUTASC          IF FULL - GO OUTPUT ASCII
C1E5 20 A3              BRA     OUTDTA          GO TO NEXT LINE

                        * SUBROUTINE TO OUTPUT ASCII CHARACTERS

C1E7 F6 C108    OUTASC  LDB     APNTR+1         LOAD CURRENT ADDRESS
C1EA C4 0F      OUTAC2  ANDB    #$0F            LINE IS FULL?
C1EC 27 0D              BEQ     OUTAC3          IF FULL - GO OUTPUT ASCII
C1EE 8D 19              BSR     OUTS            IF NOT - FILL WITH 3 SPACES
C1F0 8D 17              BSR     OUTS
C1F2 8D 15              BSR     OUTS
C1F4 86 20              LDA     #$20            AND FILL BUFFER WITH A SPACE
C1F6 A7 A0              STA     0,Y+
C1F8 5C                 INCB
C1F9 20 EF              BRA     OUTAC2          LOOP UNTILL LINE FULL
C1FB 8E C109    OUTAC3  LDX     #LINBUF         POINT TO LINE BUFFER
C1FE 86 10              LDB     #16             RESET 16-COUNTER
C200 A6 88      OUTAC4  LDA     0,X+            LOAD ASCII CHR
C202 8D CD18            JSR     PUTCHR          OUTPUT IT
C205 5A                 DECB                    DECREMENT 16-COUNTER
C206 26 F8              BNE     OUTAC4          IF ANY LEFT - LOOP
C208 39                 RTS
```

```
                    * SUBROUTINE TO OUTPUT A SPACE

C209 34  20         OUTS    PSHS    Y           SAVE Y
C20B 86  20                 LDA     #$20        LOAD SPACE
C20D BD  CD1B               JSR     PUTCHR      OUTPUT IT
C210 35  A0                 PULS    Y,PC        RESTORE Y AND RETURN

                    * SUBROUTINE TO READ ONE BITE

C212 34  20         FMS1    PSHS    Y           SAVE Y
C214 8E  C840               LDX     #FCB        POINT TO FCB
C217 BD  D406               JSR     FMS         CALL FMS - READ DATA
C21A 26  02                 BNE     LISTE       CHECK FOR ERROR
C21C 35  A0                 PULS    Y,PC        RETURN

                    * ERROR HANDLING ROUTINE

C21E A6  01         LISTE   LDA     1,X         GET ERROR STATUS NUMBER
C220 81  08                 CMPA    #8          IS IT EOF ERROR?
C222 26  0C                 BNE     LISTE2      IF NOT - PRINT ERROR NUMBER
C224 86  04                 LDA     #4          LOAD CLOSE FILE CODE
C226 A7  84                 STA     0,X         STORE IN FCB
C228 BD  D406               JSR     FMS         CALL FMS - CLOSE FILE
C22B 26  03                 BNE     LISTE2      IF ERROR - REPORT
C22D 7E  CD03               JMP     WARMS       RETURN TO FLEX

C230 BD  CD3F       LISTE2  JSR     RPTERR      REPORT ERROR
C233 BD  D403               JSR     FMSCLS      CLOSE ALL FILES
C236 7E  CD03               JMP     WARMS       RETURN TO FLEX

                        END     START

0 ERROR(S) DETECTED

SYMBOL TABLE:

APNTR   C107    CHRBUF C103     CTRBLK C104     FCB     C840    FMS     D406
FMS1    C212    FMSCLS D403     GETFIL CD2D     INIT    C12D    LDR2    C174
LINBUF  C109    LISTE  C21E     LISTE2 C230     LOADER C14C     MSG     C119
OUTAC2  C1EA    OUTAC3 C1FB     OUTAC4 C200     OUTADR CD45     OUTASC C1E7
OUTOT2  C19E    OUTDT3 C1AD     OUTDT4 C18A     OUTDT5 C1BC     OUTDT6 C1DC
OUTDTA  C18A    OUTHEX CD3C     OUTS   C209     PCRLF  CD24     PSTRNG CD1E
PUTCHR  CD1B    RPTERR CD3F     SETEXT CD33     START  C100     WN      C102
WARMS   CD03    XADDR  C185
```

```
***DUMPFILE 0.DUMPFILE.CMD
C100 20 2B 03                                          +_
C103                                  00 0A 54 52 41 4E 53          __TRANS
C120 46 45 52 20 41 44 44 52 45 53 53 20 04 BE C8 40 FER ADDRESS ___@
C130 BD CD 20 18 25 00 F9 86 01 A7 84 86 00 BD CD 33 __ _%___________3
C140 BD 84 A6 18 26 00 E9 86 FF A7 88 3B 17 00 C3 01 ____&_____;_____
C150 02 27 21 81 16 26 F5 17 00 88 B7 C1 05 17 00 B2 _'!__&____________
C160 B7 C1 06 BE C1 19 BD C9 1E BE C1 05 BD CD 45 BD ______________E_
C170 CD 24 20 D0 17 00 9B B7 C1 07 17 00 95 B7 C1 08 _$ _____________
C180 17 00 8F B7 C1 04 81 00 27 C2 BD CD 24 BE C1 07 ____'___'___$___
C190 BD CD 45 BD 74 10 BE C1 09 F6 C1 08 C4 0F 27 BD __E_t_____'_
C1A0 BD 67 BD 65 BD 63 86 20 A7 A0 5A 26 F1 BD 63 B7 -g-e-c- __Z &--c-
C1B0 C1 03 81 7E 22 04 01 1F 22 02 86 9F A7 A0 34 20 ___~"___"_____4
C1C0 BE C1 03 BD CD 3C 35 20 BD 3F BE C1 07 38 01 BF _____<5 _?___8__
C1D0 C1 07 7A C1 04 26 05 6D BE 16 FF 70 86 __z__&_____p_
C1DD                                  C1 08 84 ___
C1E0 0F 26 CA BD 02 20 A3 F6 C1 08 C4 0F 27 BD BD 19 _&___ ____'___
C1F0 BD 17 [illegible] A7 [illegible] C1 09 C6 10 _____ _____
C200 A6 A0 BD CD 18 5A 26 F8 39 34 20 86 20 BD CD 18 _____Z&_94_ ____
C210 35 A0 34 20 BE C8 40 BD D4 06 26 02 35 A0 A6 01 5_4 __@___&_5___
C220 81 08 26 0C 86 04 A7 84 BD D4 06 26 03 7E CD 03 __&_____&_~__
C230 BD CD 3F BD D4 03 7E CD 03                       __?___~__

TRANSFER ADDRESS C100
```

DON...

MY "INPUT" FOR THIS WEEK IS ANOTHER OF MY DUMB QUESTIONS. I REALIZE THAT I KNOW LESS ABOUT MACHINE LANGUAGE PROGRAMMING THE 6808 THAN 99.999% OF YOUR READERS, AND EVEN LESS ABOUT THE 6809.

QUESTION: WHAT IS THE PRACTICAL USE OF THE BRN (BRANCH NEVER) INSTRUCTION FOR THE 6809? WHAT DOES THIS ACCOMPLISH THAT SIMPLY OMITTING A BRANCH INSTRUCTION WOULD NOT ACCOMPLISH? I KNOW THAT THE ANSWER IS GOING TO BE OBVIOUS WHEN CITED, BUT I WOULD LIKE TO SEE THAT ANSWER.

JOHN TUCKER
P. O. BOX 2898
LAREDO, TEXAS 78041

Dear Sirs, I would like to submit a patch for SSB DOS 68.51 to change FORMAT from 35 to 40 tracks.

```
change 043F     CE12 23
to              CE12 29

change 053E     A2 51 02 74
to              AB 51 02 E0
```

Thanks for the magazine, but would like to see more for SSB systems. Like a mailing list.

Michael J La Bombard
1541 Saturn B1 207
San Diego, Cal 92154

HELP

SWTPC 6800'ers with CASSETTE Storage: I'd like to purchase FOURTH ad/or PASCAL CASETTE Interpreter(s). Anyone who has an address(es) of vendors for Cassette 6800 programs, I'd appeciate it if you'd drop me a line and give me their addresses. Please note, I'm US P.O. DOMESTIC rates (18 cents) for First Class. Thanks!! George Kelm, P.O.Box 160, Yap Island, Guam 96943.

***

Robert Findlay
c/o Scelbi Computer Consulting Inc.
1322 Rear-Boston Port Rd.
Milford, Ct 06460

Dear Mr.Findlay,

I have your book "6800 Software Gourmet Guide & Cook Book".

I am trying to get the "Relocatable Floating Point Program" in appendix F to work on my SWTPC 6800 computer but no luck so far. Perhaps you could offer some suggestions.

First, the MONITOR in SMARTBUG, which may be the cause of the problem although it has the standard MIKBUG commands.

Next, I'm not sure where the program starts. I insert 0100 in A048 and A049, punch G and all I get is a number like .435879E-10 and then back to the monitor.

Any help you can give me would be appreciated. I've checkd and quadruple checked the accuracy of the entered program.

Thanks, Rene Pettet
3519 Tamsin
Kalamazoo, MI 49008

Dear Sir,

I sent the above letter to SCELBI but it was returned as undeliverale to the addressee.

Is it possible tha one of your editors could answer my question as to why the program won't work for me. If not, do you know of a floating point program that I could use at assembly level that is free, published, for sale or in some way available for the 6800. Thank you, Rene Pittet

***

Dear Gentlemen,

Just recently I traded my micro for a SWTP 6800 system with 32K of memory and a MP-A CPU board only to find out that it would cost an arm and a leg to convert it to a disk-based system. As a result, I am hoping for an alternative.

Since I have a CT-30 that came with the micro, I would greatly appreciate if you could tell me where to get an Extended BASIC compiler in cassette format.

Please find enclosed a self-stamped and addressed envelope for tha return correspondence. Many thanks. Walter Ta, 1-27 Black Mountain Rd, L5, San Diego, Cal 92126.

***

CLASSIFIED

SWTPC MPA (CPU) $50.00, MPC $20.00, 8K memory (2) $50.00 each, 4K memory $25.00, Digital Research 16K memory (SS50) w/o memory chips $60.00. 1 with 300 ns memory chips $150.00, CT 1024 64 X 16 $100.00, complex except as noted, fully socketed and working. G.C.Shattuck, Rt 2, Box 445, Hillsboro, NH 03244 (603)464-3850.

•

SWTPC 6800, 48K system, CT-64, MF-68, PR-40, Centronics 730, AC-30, Flex 2.0,etc. $2600.00. Tom MacKnight W:(215)786-6022; H(215)TR6-2177 5200 Hilltop G3, Brookhaven, PA 19015.

***

COMPUTER SYSTEMS CONSULTANTS, INC.

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SOFTWARE DEPARTMENT

(ALL PROGRAMS PROVIDED IN SOURCE ON DISK SPECIFY 5"/8")

SUPER SLEUTH Disassembler System (for FLEX* systems)		$ 99.00
—runs on 6800/1/9, analyzes 6800/1/9 and 6502		
—easy to use, self-instructive, with 42-page manual		
—automatic labels, optional FCB, FCC, FDB's		
—input binary file from disk or from memory		
—memory changes to program thru full-screen editor		
—output disk file may be source or new binary file		
—commands from menu or from and to disk file		
—generates FLEX* and user-defined names		
—includes assembler language XREF program		
—contact SMOKE or CER-COMP for non-FLEX* systems		
Z-80/8080/8085 Disassembler (Similar to SLEUTH)		$ 99.00
—runs on 6800/1/9, analyzes Z-80/8080/8085		
6800/1,6805, 6502,Z-80,8080/5 Cross-assemblers	EACH	$ 50.00
—macro sets for TSC 6809 Macro Assembler	ANY 3	$100.00
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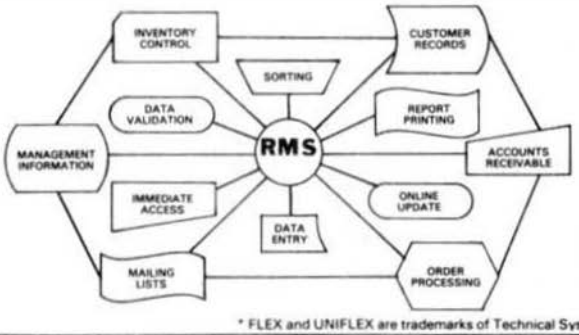

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Origin	upper left corner
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Write sync	interlocked
Blanking	program controlled
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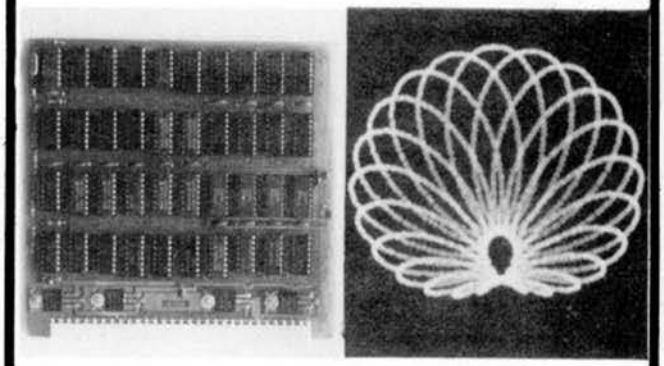

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- Relates high-level programming concepts to their counterparts in assembly language (throughout the book).
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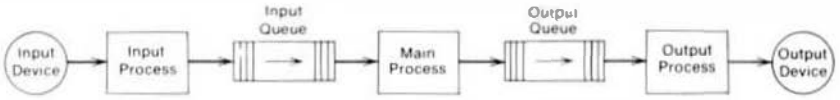

ABOUT THE AUTHOR

John Wakerly is a computer engineer who has designed microcomputer hardware and software systems in industry, and who has also taught computer engineering to freshmen through graduate students at Stanford University since 1974.

Two years ago Prof. Wakerly set out to write a definitive computer organization and assembly language programming book using microcomputers as examples. He found that the Motorola 6809 had the very best architecture from a pedagogical point of view. Today, he is an avid 6800 and 6809 programmer, and he uses a 6800 based word processing system to write textbooks.

ABOUT MSE BOOKS

MSE Books is a subsidiary of the author's consulting firm, Micro Systems Engineering. Although MICROCOMPUTER ARCHITECTURE AND PROGRAMMING will be available through bookstores, there are several advantages to ordering directly from MSE Books: 10% discount from publisher's list price of $27.95; prompt delivery; convenient payment methods (charge it!); and automatic notification of any updates. Also, the author will autograph your copy upon request!

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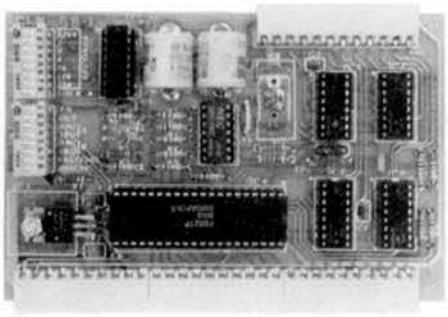

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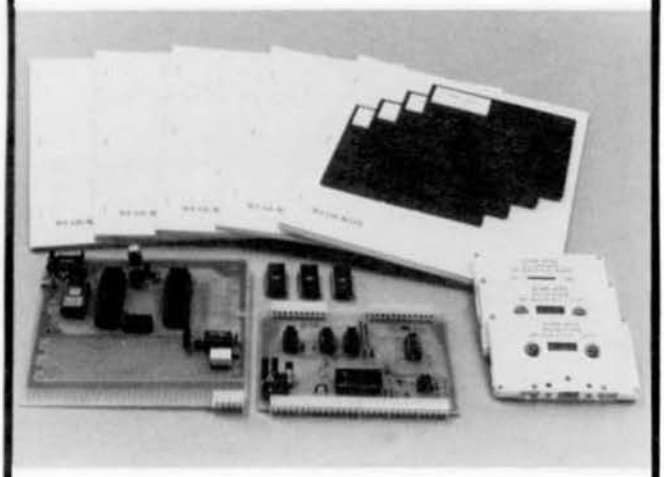

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SBC-02 single board computer uses 6802 with RAM, ROM, I/O. Ideal controller, intelligent interface, and more. Printed circuit board is $25, complete controller kit $75, wired and tested $150. Also available: HUMBUG (see below). Basic in ROM, etc.

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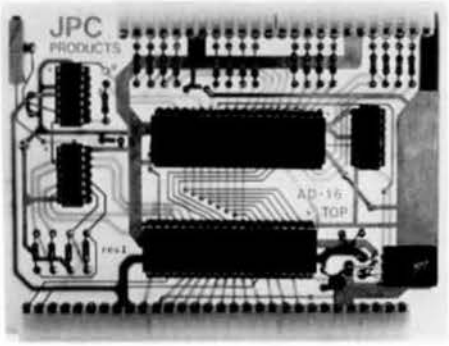

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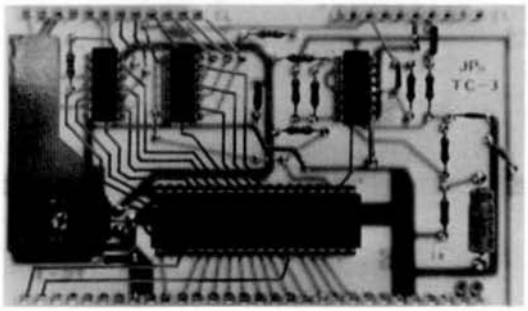

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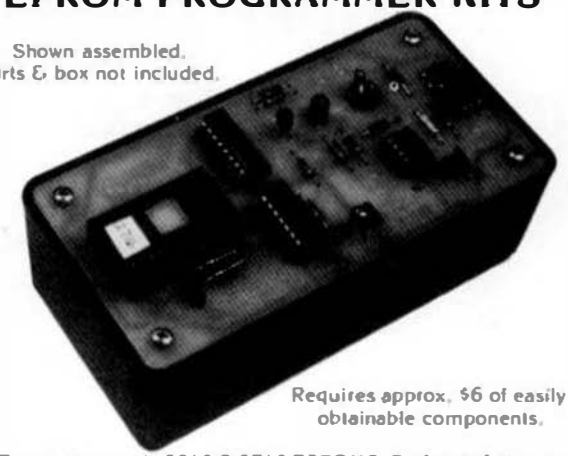

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By
Edgar M. (Bud) Pass, Ph.D

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SUPER SLEUTH is a set of programs which enable the user to examine and/or modify binary program files on disk, or in memory. Programs may be disassembled into source code format and the source saved on disk. Labels produced by SLEUTH can be changed globally to labels of your own preference. Cross reference lisings of labels can be produced to aid in debugging the program. Programs in ROM can be "altered" with the altered program being saved on a disk file. The resultant file can then be used to reprogram a new ROM.

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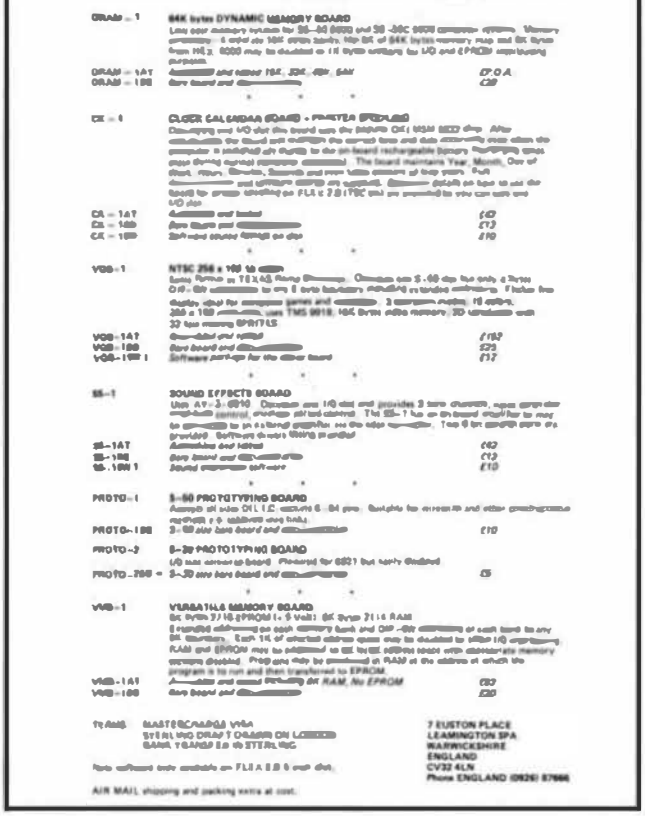

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FEATURES –

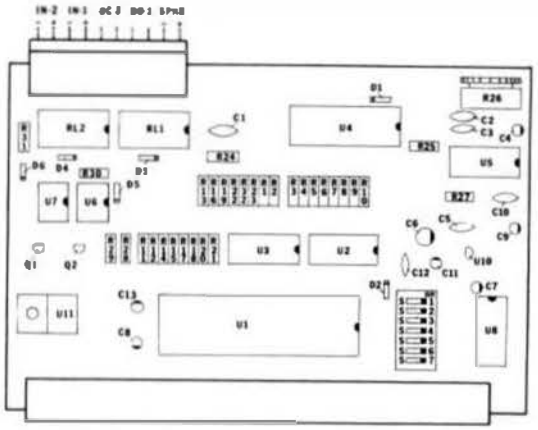
- phoneme coding allows unlimited speech
- low data rate doesn't bog CPU time
- efficient - very little memory needed for messages
- programmable inflection and pitch
- on-board amplifier drives 4- or 8-ohm speaker directly
- assembled, tested, burned in
- meets Class A device radiation limits under FCC Part 15
- dip-switch decode select for 4- or 16-address I/O
- dip-switch programmable NMI and IRQ interrupts

SPECIFICATIONS –

PHONEME CODES	- 61 plus 2 pause, 1 stop
INFLECTION LEVELS	- 4 major, 16 minor - 64 total
VOICE PITCH	- male baritone, variable bass to tenor
DATA RATE	- 4 to 20 BPS, depending upon phoneme
MESSAGE MEMORY	- approx. one byte-per-letter in English
AUDIO OUTPUT	- .2 watt average, 2 watt peak into 8-ohms
RESIDUAL NOISE	- -45 dBm typical
SIZE	- 3 1/2" by 5 1/4" (standard I/O size)
LOCATION	- one 30-pin I/O slot
ADDRESSING	- four addresses in I/O space
POWER REQUIREMENT	- +8 vdc @ 100 ma., +14 vdc @ 150 ma. max.
SPEAKER CONNECTOR	- 10-pin molex, mating half supplied

SOFTWARE –

- VOX-EDITOR mnemonically edits message (source included)
- example programs in assembly and Basic
- speech files
- shipped on 5- or 8-inch disk for single-user TSC or SSB DOS
- 6800 or 6809 code



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MICROPRODUCT BULLETIN

Why SSB?

Let's face it, some of you just don't know who Smoke Signal Broadcasting is and what we provide for the 6800, 6809 and SS-50 user. This bulletin will be the first in a monthly series appearing in this magazine, and for starters we'd like for you to get familiar with us.

The Products. Since 1977, we've been designing, developing and manufacturing microcomputers — and associated products — based on Motorola's 6800 and 6809, and configured to the SS-50/SS-50C Bus.

Our **CHIEFTAIN** Series of microcomputers range over a broad span of configurations to fulfill any capacity need. The **CHIEFTAIN** 622 is a 5¼-inch dual drive/dual density 6800-based system with 32K RAM (expandable). It's priced at only $3495.00.

The 9624 is a dual 5¼-inch octodensity 6809-based system with 1.6 Mbytes of disk storage, priced at only $4029.00.

A **CHIEFTAIN** 9622 is the dual 8-inch double-sided dual density computer system, taking full advantage of the 6809, priced at a mere $4675.00. Eight-inch Winchester computer systems are also available in either 10 Mbyte (98W10) or 30 Mbyte (98W30) storage configurations.

The Hardware. All of our boards and complete systems are **Endurance Certified** to completely assure you of the latest in industry-standard and state-of-the-art technology. Our DCB-4 Double Density Controller Board ($449.00) became the Standard Controller Board for the 6800 and 6809, handling up to four 5¼-inch and four 8-inch drives simultaneously. Smoke Signal provides the most innovative solutions for the 6800/6809 SS-50 Bus structure that money can buy.

The Software. Five operating systems (including FLEX and OS-9 Multi-User) are running on the **CHIEFTAIN** Series with NO configuration problems. SSB DOS68D and DOS69D (each $75.00) were developed in-house and have become leading standard operating systems.

Smoke Signal provides Business Application Software to fulfill all vertical needs of the business-person who is automating.

Our systems software, in conjunction with our DOS, will accomplish any task from text editing and processing up to our Super MACRO-ASSEMBLER that will produce code for every Motorola 6800/6809 family of processors available.

OS-9 Level One and Level Two are the new multi-user and multi-tasking operating systems that will make the 6809 reach the highest potential. COBOL, FORTRAN, Random File BASIC, Pascal, FORTH and SDBASIC (compiler) are all available for the **CHIEFTAIN**.

Convince Yourself:

Prices. SSB does not sacrifice quality for low cost. The **CHIEFTAIN** Series of computers are **not** expensive, yet are the absolute best 6800 or 6809 computers you can buy!

SOME OF OUR PRODUCTS:

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CHIEFTAIN 9622	3625.00
CHIEFTAIN 9624	4025.00
CHIEFTAIN 622	4675.00
CHIEFTAIN 9622	4675.00
CHIEFTAIN 98W10	6695.00
CHIEFTAIN 98W30	9995.00
M-16-X (16K RAM)	299.00
M-24-X (24K RAM)	439.00
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DCB-4 (includes DOS)	449.00
VDB-1 Video Board	395.00
LMB-1 Motherboard	229.00
SSB DOS (68D or 69D)	75.00

All CHIEFTAINS come **standard** with 32K of RAM; Two Serial I/O Ports; SSB DOS68D or 69D; two disk drives; 6800 or 6809 CPU; a DCB-4; cables; power supply and LMB-1 Motherboard. All connectors are gold-plated. You receive complete and accurate manuals with every product.

Smoke Signal Broadcasting provides support. We will stand behind every product that goes out the door, and you can hold us to that. We realize that this is a time when other manufacturers are playing number games, and forgetting quality for the sake of quantity. Ask any SSB user about our factory support. If **that** doesn't convince you, **nothing** will!

Why Smoke Signal Broadcasting? Because we're the best. We produce state-of-the-art 6800 and 6809 products for the SS-50 Bus that are not headaches . . . that will not require carrying a screwdriver around . . . and that are efficient, fast, productive and reliable computers.

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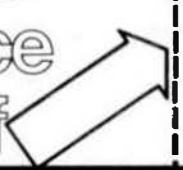

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Specify 6800 or 6809, SSB or FLEX™, 5" or 8"

ALL IN ONE for only $45.00
Editor - Text Processor - Mailing Labels
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Supports Editing commands such as bottom, change, delete, find, insert (single line), input (multiple lines), list, next, overlay (with cursor editing, character deletion and insertion), overstrike (for selected darker text), print, restart, set, top, underline, up, and verify.

Supports Text Processing commands such as block copy, block move, centering, margin justification (wide and narrow), paging, and tabbing.

Mailing Lists and Labels. Use the same mailing list disk file (with protected areas) for both mailing labels and repeat letters. Repeat letters are personally addressed to each person or selected persons on the mailing list.

Most Powerful File Handler found in any editor. Append one file to the end of another or insert (merge) one file into another as designated by the line pointer. Print specified lines to your printer or to a disk file. Edit files larger than the text buffer. Does not produce output files when not desired. Delete disk files from the editor.

Printer commands. Control characters can be sent to the printer for format control either directly from the control terminal or by imbedding them in the text. The set command contains interface initialization and character output routines to support the SWTPC MP-C interface as well as the standard serial and parallel interfaces. Jumps are also provided to user supplied printer routines. User selects the port address (0 thru 7, A or B) thereby eliminating the need for the user to install printer software routines. Editor can be initialized for either 4 or 16 addresses per port.

Editor allows exiting to either the monitor or DOS and then reentering (warmStart) without destroying previously prepared text in the buffer. The Restart command erases contents in the buffer without the user having to reload the Editor.

The Editor allows the user to toggle between full duplex (no echo) and half duplex (echo) as needed. It responds to commands in both upper and lower case and can be used to create assembler source code and Basic programs as well as text.

Specify 6800 or 6809, SSB or FLEX™, 5" or 8" 45.00
Printed source listing is available for an additional 35.00

Software by Technical Systems Consultants, Inc.

Flex™ (includes Editor and Assembler) 150.00
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Editor 50.00
Assembler 50.00
6809 Cross Assembler on 6800 100.00
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S3216 Universal Static Memory Board with 16K Ram 295.00
S3232 Universal Static Memory Board with 32K Ram 495.00
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69/K Kit version of above 575.00
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SEE GIMIX AD PAGES 3 & 86

ELEKTRA™ SS50 Computer Products

Dual Port Serial Interface bare board and documentation 20.00
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Motherboard bareboard and documentation*
(motherboard is terminated and has ground plane separating each of the data and address lines)
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*Price to be announced when product is available.
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(See review in Feb 1980 '68' Micro Journal)

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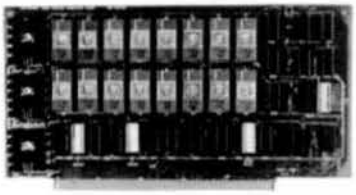
32K S-100 EPROM CARD

NEW!



$74.95 KIT

USES 2716's

Blank PC Board - $34

ASSEMBLED & TESTED ADD $30

SPECIAL: 2716 EPROM's (450 NS) Are $11.95 EA. With Above Kit.

KIT FEATURES

1. Uses +5V only 2716 (2Kx8) EPROM's.
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible.
4. Addressable as two independent 16K blocks.
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6. On board wait state circuitry if needed.
7. Any or all EPROM locations can be disabled.
8. Double sided PC board, solder-masked, silk-screened.
9. Gold plated contact fingers.
10. Unselected EPROM's automatically powered down for low power.
11. Fully buffered and bypassed.
12. Easy and quick to assemble.

32K SS-50 RAM

$379.00 KIT

For 2MHZ Add $10

Blank PC Board $50

For SWTPC 6800 - 6809 Buss

Support IC's and Caps $19.95

Complete Socket Set $21.00

Fully Assembled, Tested, Burned In Add $30

NEW!

At Last! An affordable 32K Static RAM with full 6809 Capability.

FEATURES:

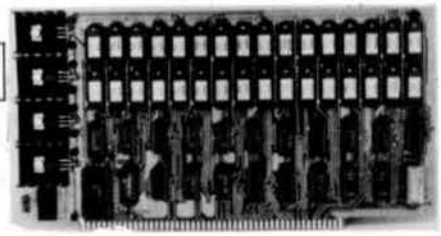
1. Uses proven low power 2114 Static RAMS.
2. Supports 6850C - EXTENDED ADDRESSING.
3. All parts and sockets included.
4. Dip Switch address select as a 32K block.
5. Extended addressing can be disabled.
6. Works with all existing 6800 6850 systems.
7. Fully bypassed. PC Board is double sided, plated thru, with silk screen.

16K STATIC RAM KIT-S 100 BUSS

PRICE CUT!

$199.95 KIT

FOR 4MHZ ADD $10



KIT FEATURES:

1. Addressable as four separate 4K Blocks.
2. ON BOARD BANK SELECT circuitry. (Cromemco Standard!). Allows up to 512K on line!
3. Uses 2114 (450NS) 4K Static Rams.
4. ON BOARD SELECTABLE WAIT STATES.
5. Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers.
6. All address and data lines fully buffered.
7. Kit includes ALL parts and sockets.
8. PHANTOM is jumpered to PIN 67.
9. LOW POWER: under 1.5 amps TYPICAL from the +8 Volt Buss.
10. Blank PC Board can be populated as any multiple of 4K.

BLANK PC BOARD W/DATA-$33

LOW PROFILE SOCKET SET-$12

SUPPORT IC'S & CAPS-$19.95

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OUR #1 SELLING RAM BOARD!

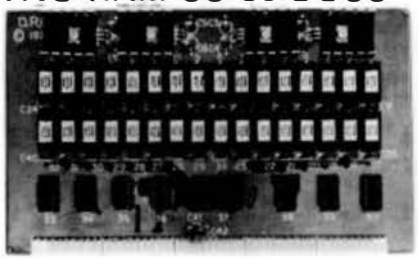
16K STATIC RAM SS-50 BUSS

PRICE CUT!

$195 KIT

FULLY STATIC!

FOR 2MHZ ADD $10



FOR SWTPC 6800 BUSS!

ASSEMBLED AND TESTED - $35

KIT FEATURES

1. Addressable on 16K Boundaries.
2. Uses 2114 Static Ram.
3. Fully Bypassed.
4. Double sided PC Board. Solder mask and silk screened layout.
5. All Parts and Sockets included.
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BLANK PC BOARD—$35 COMPLETE SOCKET SET—$12

SUPPORT IC'S AND CAPS—$19.95

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S-100 SOUND COMPUTER BOARD

At last, an S-100 Board that unleashes the full power of two unbelievable General Instruments AY3-8910 NMOS computer sound IC's. Allows you under total computer control to generate an infinite number of special sound effects for games or any other program. Sounds can be called in BASIC, ASSEMBLY LANGUAGE, etc.

COMPLETE KIT! $84.95 (WITH DATA MANUAL)

BLANK PC BOARD W/DATA $31

KIT FEATURES:

- TWO GI SOUND COMPUTER IC'S.
- FOUR PARALLEL I/O PORTS ON BOARD.
- USES ON BOARD AUDIO AMPS OR YOUR STEREO.
- ON BOARD PROTO TYPING AREA.
- ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED.
- PC BOARD IS SOLDERMASKED, SILK SCREENED, WITH GOLD CONTACTS.
- EASY, QUICK, AND FUN TO BUILD, WITH FULL INSTRUCTIONS.
- USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY.

Both Basic and Assembly Language programming examples are included.

SOFTWARE:

SCL™ is now available! Our Sound Command Language makes writing Sound Effects programs a SNAP! SCL™ also includes routines for Register-Examine-Modify, Memory-Examine-Modify, and Play-Memory. SCL™ is available on CP/M* compatible diskette or 2708 or 2716 Diskette - $34.95 2708 - $16.95 2716 - $39.95. Diskette includes the source EPROM'S are ORG at E000H.

4K DYNAMIC RAM BLOWOUT!

SAME AS INTEL 2107B!

4K RAMS AT AN UNBELIEVABLE 50¢ EACH!!!

Prime, new, National Semi., 1979 date coded, full spec, parts, N.S. #MM5280-5N. Same as INTEL 2107B-4, T.I. TMS4060, NEC uPD411, etc. We bought a HUGE QTY. from a West Coast Distributor at truly DISTRESS PRICES! One of the most popular and reliable RAM's ever made. These parts have been used by almost all Major Computer Main Frame Mfg. the world over! Arranged as 4K x 1, 270 NS Access Time, 22 Pin Dip. These units DO NOT use multiplexed addressing, thus making REFRESH and other timing very simple. See INTEL MEMORY DESIGN HANDBOOK for full application notes. The NAT. SEMI. MEMORY DATA BOOK is available at most Radio Shack Stores. Prime units in original factory tubes!

(With Pin Out Data) **#5280-5N 4096 BITS x 1 270 NS ACCESS**

8 FOR $4.95 32 FOR $16

FACTORY CASE (450 PCS) — $180

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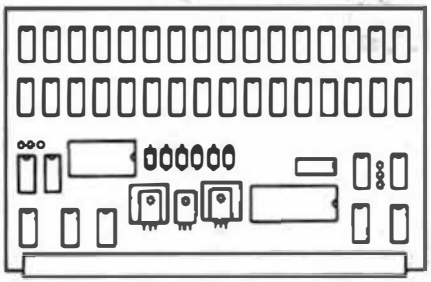

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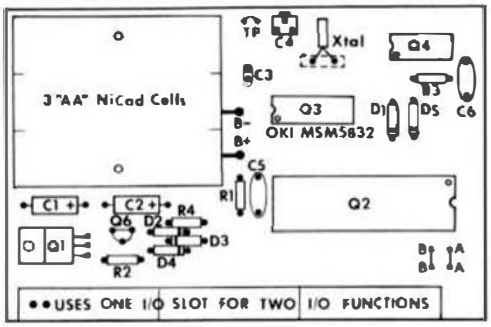

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IMAGINE

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RESULTS

For many of your users, a convenient and attractive package will be as important as the stuff that's inside. Your ultimate 6800 system will have to be more than a collection of modules, boxes, and power supplies if it is going to serve users who want Results as much as they want technology.

Your ultimate 6800 system won't forget OEM'S and Systems Houses either. Real-world applications usually call for modularity, adaptability and flexibility. You want to make sure that your ultimate 6800 system has both RS-232 serial interfaces and parallel input-output. If possible the system will provide space and power for custom circuitry inside the main enclosure.

As you spend endless hours thinking and planning the ultimate 6800 system, one question keeps coming up, time and time again: how can you include all of these wonderful features in the system and still keep the cost down so that low price will be a benefit, too?

A BREAKTHROUGH

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Whether you have a disk drive in your main Series 2000 enclosure or have all of your disks outboard, you can still have up to 2.8 megabytes of dual-density 5.25 inch floppy disk storage...or as little as 160K bytes. And if you need more storage, there's a Winchester waiting just for you.

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WE DO NOT FORGET THE OEM

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WHAT MORE CAN ONE SAY?

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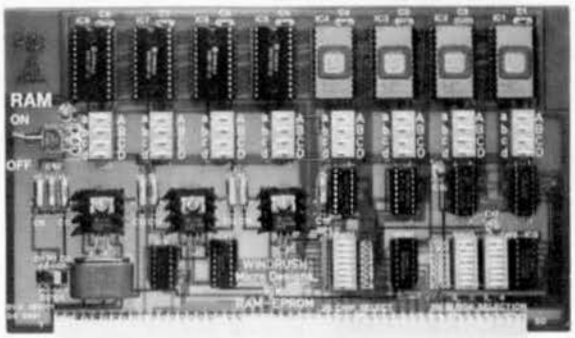

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HIGH DENSITY permits greater memory expansion to meet the needs of todays sophisticated, multi-user/multi-tasking operating systems.

ADDRESSABLE in two 32K sections that have their own decoding for both the regular and extended (SS-50C) address lines. Each section can be addressed to any 32K boundary in the address range (1M BYTE with extended addressing). The 32K sections are divided into four 8K blocks that can be individually enabled or disabled. Disabled sections do not occupy any address space.

RELIABLE like all GIMIX products, the 64K BYTE CMOS STATIC RAM is designed with reliability in mind. Series damping resistors, a fully gridded power and ground layout, and generous power supply decoupling, all contribute to reliability and data integrity. An unsafe voltage detect circuit inhibits writes to the board, when the 8V. supply falls below a preset level, to prevent loss of data during the transition between system and battery power.

The GIMIX 64K BYTE STATIC RAM BOARD is ideally suited to a wide variety of applications.

Its high density and ultra-low power consumption make it possible to greatly expand systems with a few available bus slots and limited power supply capabilities.

The battery back-up feature is useful where data loss due to power failure cannot be tolerated, or as a replacement for disk or tape storage where conditions such as environment prohibit their use. Since the entire board can be hardware write protected by a switch located at the top of the board, it can also be used to emulate PROM or ROM memory. This is especially useful during firmware developement where frequent software changes must be made.

When the board is used in conjunction with a device such as the GIMIX MISSING CYCLE DETECTOR BOARD, which monitors the A.C. line and generates an interrupt when a power failure occurs, critical data can be stored and system integrity maintained during either expected or unexpected power outages.

The **GIMIX 64K BYTE STATIC MEMORY BOARD** is available in 56K and 64K versions. Both version include all of the above features; gold bus connectors; and come fully assembled, burned in, and tested.

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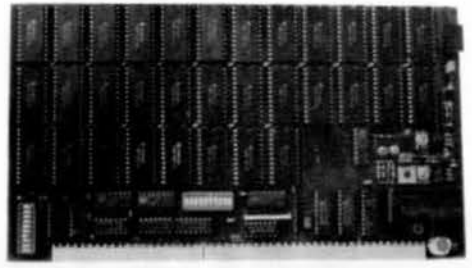
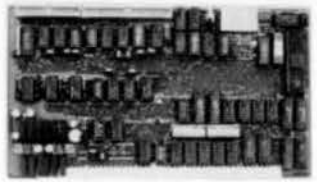


GIMIX KNOCKS OUT DISK PROBLEMS



GIMIX DMA DOUBLE DENSITY DISK CONTROLLER #68

The GIMIX Data Direct Memory Access DISK CONTROLLER has the capabilities needed to realize the full potential of todays sophisticated multi-user/multi-tasking operating systems such as OS-9™ and UniFLEX™.

HIGH SPEED using bi-polar logic DMA circuitry for guaranteed operation at 2MHz. DMA transfers take place at full bus speed using 6809 cycle steal DMA. Once the required parameters are passed to the controller and DMA transfer is initiated the processor is free for other tasks. Interrupts can be generated to indicate the completion of the transfer.

SINGLE AND DOUBLE DENSITY data storage on any combination of 5¼" and 8" floppy disk drives, single and double sided, single and double track density, up to 4 drives total.

LOW ERROR RATES are insured by a phase lock data recovery circuit (data separator) and adjustable write precompensation circuitry for drives that require precomp. Separate precomp adjustments are provided for 5¼" and 8" drives.

ADDRESSABLE to any 8 byte boundary in the address space (1M byte when extended address decoding is used). The board occupies only 8 bytes of address space.

EXTENDED ADDRESSING control using the SS-50C extended address lines. Control of the extended address lines allows the board to perform DMA transfers to and from any address in the 1M byte address space.

FULLY BUFFERED with separate 5¼" and 8" output buffers and schmitt trigger input buffers for the disk drive signals.

The DMA controller leaves the processor free to perform other tasks once the transfer is initiated, unlike programmed I/O disk controllers which require full time use of the processor during data transfers to and from disk.
This is extremely important in a multi-user/multi-tasking environment as the processor can perform other tasks such as console I/O while a disk transfer is in progress.

#68 fully assembled, burned in, and tested $548.68

GIMIX DOUBLE DENSITY PIO DISK CONTROLLER #28

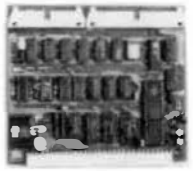
The GIMIX DOUBLE DENSITY PIO (PROGRAMMED I/O) DISK CONTROLLER is a versatile floppy disk interface for use in 6809 systems on the SS-50 or SS-50C bus. The board physically occupies one slot of the 30 pin I/O bus.

- Double the unformatted storage capacity of single density controllers
- Single and double density operation
- Phase lock data recovery circuit (data separator)
- Adjustable write precompensation (precomp)
- Controls up to four 5¼" drives
- Controls single and double headed drives
- Designed to meet the data hold-time requirements of the Western Digital 1797 floppy disk controller I.C.

The GIMIX DOUBLE DENSITY PIO DISK CONTROLLER is ideal for systems that require greater data storage than that provided by single density controllers, without increasing the number or type of drives. In most cases existing 6809 systems can be upgraded by adding only the controller and the appropriate operating system software.

#28 fully assembled, burned in and tested $348.28

GIMIX 5/8 DISK CONTROLLER BOARD #58



The GIMIX 5/8 DISK CONTROLLER is a versatile floppy disk interface for use with both 6800 and 6809 systems on the SS-50 or SS-50C bus. The board physically occupies one slot of the 30 pin I/O bus.

- Hardware and software are compatible with existing disk controllers (SWTPC DC-1, DC-2 and DC-3)
- Controls up to four 5¼" drives in 6800 systems
- Controls any mix of 5¼" and 8" drives, up to four drives total, in 6809 systems
- Provides for double headed drives
- Synchronous data separator for data reliability
- Designed to meet the data hold-time requirements of the 1771 floppy disk controller I.C.

The GIMIX 5/8 DISK CONTROLLER is ideal for a variety of applications including the upgrading of computers or existing systems. As a customer it can provide the added advantages of a data separator, double headed drive capability, and in 6809 systems the ability to use 8" drives. Double headed drives and 8" drives may require appropriate operating system software.

#58 fully assembled, burned in, and tested $226.58

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